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Oil Gas.

[A paper prepared by MR. L. B. JONES, for Twenty-first Meeting, Pacific Coast Gas Association.]

It is not my intention to attempt to cover the scope suggested by the title of this paper, but merely to review a series of experiments (with the resultant developments) carried on in San Francisco the past few years.

Since 1902, when gas made exclusively from crude oil was first introduced as the supply of a large city, until today, when oil gas is used to the exclusion of all other methods of production in California, many doubted the eventual success of this process. But the doubters were not in the ranks of the true oil gas men, the pioneers who conceived the idea of the manufacture of gas from crude oil years before the enormous production of crude oil in California made oil gas an economic necessity, and those who nursed the infant industry and bravely bore the discouragement of failures and put on a solid running basis an industry which, in the hands of less determined men, might easily have been a failure.

These men worked (and are still working) for the success of oil gas from a purely unselfish love of the business, and upon such men and such principles depend the perfection to which oil gas will and must attain.

For years the one feature which prevented oil gas from being an ideal process for gas manufacture was the large percentage of the rich hydrocarbons of the oil which are dissociated, only the hydrogen portion of which appears in the gas, the carbon being a by-product. The severe treatment of the oil with extremely high heats was the cause of the excessive production of lampblack in the early days of oil gas, and the proportionately poor quality of the gas as well.

The fault was not alone the extreme temperature, but the lack of uniformity of temperature, the extremely high temperature being in a measure what we might call "false heat" or "surface heat;" that is, the actual temperature existed, but its capacity for doing work in the breaking up of the oil was lacking. The extreme temperatures lasted only during the beginning of a run or gas-making period, and in the latter part of a run the temperatures were far below any now utilized for gas making. Were this not so, the efficiency of the original oil gas would have been extremely high, only the quality of the gas being low. Had uniformly high heats been employed, the first oil gas men would have encountered no scrubbing troubles other than the removal of lampblack, and tar would have been an unknown trouble; but this we know was not the case.

The oil used per 1,000 was high, the quality of the gas was low, and tar as well as lampblack represented a large portion of the oil. In each run a portion of the oil was destroyed through being subjected to a temperature far in excess of the bonding point of its hydrocarbons, and the remainder was stewed at temperatures below the fixing point of a commercial gas.

It was soon realized that, during the run at some intermediate point between the extremes of temperature, the oil was subjected to the proper degree of heat, a treatment that produced not only a good quality of gas but efficient results. However, this point was quickly reached and more quickly passed, and the results attained were lost in the aggregate. By a process of elimination we may assume that, if one temperature is right for the reforming of the oil all the rest must be wrong, and from this theory the striving has been toward the maintaining of a uniform temperature, the treatment of all the oil alike. The greatest mechanical development tending to unify the heat to which the oil is subjected was the improvement of the 2-shell machine, with the gas off-take intermediate of the point of combustion of the oil used for heating the generator and the stack valve. It has been definitely proven, not only by experience but by careful tests, that the heat of the checkerbrick or heat reservoirs immediately adjacent to the stack valve, and also the point where the initial combustion of the heat oil takes place, is "false heat" or "surface heat," lacking the body, and is not the substantial heat which we find in the checkerbrick in the central portion of the generator. This is due to the fact that, when oil is injected into the machine together with a forced blast of air for heating the apparatus, combustion is not immediately complete, but the heat of the checkerbrick is utilized in a gradually lessening degree to convert the oil into a gaseous or more easily combustible state until the combustion is complete. The following three samples of combustion products will show more clearly what I have endeavored to explain:

	CO_2	O_2	N_2
Sample No. 1	14.2	0.0	85.8
" " 2	15.0	0.0	85.0
" " 3	15.4	0.0	84.6

These samples were taken in their order, simultaneously at increasing distances from the combustion chamber, the increasing

percentage of CO_2, showing the combustion to be more nearly com plete some distance from the initial point of combustion. The reason for the lack of stability of the heat in the checkerbrick nearest the stack is usually an economic one.

In order to minimize the loss of heat at the stack, the combustion should be regulated so that the maximum liberation of heat is in the central portion of the checkerwork, the checkerwork nearest the stack getting only the tail end of the combustion; and, while the brick attain a considerable temperature, they do not attain any great quantity of heat.

A result of these peculiar combustion conditions is the inverse variation of the temperatures in the two ends of a generator. If the combustion end is excessively hot the stack end will be proportionately cool. From this fact, the two-shell machine, with the gas offtake intermediate of the course of combustion in heating, derives its undisputed advantage over all other forms of generators, the natural balance of heat in the two shells maintaining a uniform quality and production of gas at all times.

In the 2-shell sets, where oil is injected with steam into the top chamber of both the long and short-shell, simultaneously, for gas making, and the gas off-take is located in the lower half of the long shell, the first temperature to which the oil is subjected is not the maximum temperature. The checkerbrick in the upper portion of each shell with which the oil first comes in contact do the greatest amount of work, and are the regulators which limit the quantity of oil per run; but the temperature of these brick does not constitute the fixing or superheating temperature to which the gas is subjected in the central portion of the long shell near the off-take. While the temperature in the upper portion of the checkerbrick in each shell to which the oil and steam are first subjected varies several hundred degrees F. during a run, the superheating or fixing temperature remains fairly constant.

The gas made during the entire run, therefore, is fixed at very nearly a uniform temperature, the gas made in the early part of a run being fixed instantly, while that made in the latter portion of the run requires a longer passage through the brick before being fixed.

In the past 10 years the art of manufacturing gas from crude oil has advanced rapidly, until to-day the modern oil gas is, without doubt, the most nearly ideal fuel, being superior in many respects to coal or water gas. The advancement has been not alone in the quality of the gas but equally in the efficiency of production, and oil gas (the infant industry) now compares favorably with the older methods as regards a comparison of production, raw material used and unchanged by-product. The coal gas man is forced to find a market for his by-product, while the oil gas man is more fortunate, as he may utilize the carbon by-product for the production of water gas and thus stay exclusively in the gas business. For several years, the large oil gas works have maintained water gas units for utilizing the lampblack, and thus practically all of the oil is eventually converted into gas; but this meant the duplication of a great deal of apparatus and duplicate handling of the raw material, first as oil, then the separation of the by-product and the handling as water gas fuel. The extra labor is excessively expensive when compared with the ideal oil gas, or the production of oil gas without the lampblack by-product. And it is thus along these lines (the combining into one process of what was accomplished in two) that the oil gas engineer has been working.

The first step was to study the existing conditions in the production of lampblack water gas. To attempt to reproduce in an oil gas set the conditions existing in the generator of a water gas set was apparently hopeless. The extreme temperature of the fuel bed, which makes the dissociation of steam and the conversion of most of the carbon to carbon monoxide possible, would be disastrous to the hydrocarbons of the oil, and (as a luminous high heat gas is still the requirement), the attempt to imitate the generator portion of the apparatus was given up. While the apparatus used in the production of water gas from lampblack is substantially the same as that employed when coal is used as the base, certain differences exist in operating conditions. The best results are obtained with an empty carburetor, using no checkerwork. The temperatures employed are higher and the time of contact proportionately less than when using coal. The same quality of oil is used for enriching the water gas as used in producing oil gas. The carburetor and superheater temperatures are nearly as great as those employed in oil gas, yet no lampblack is produced. Wherein lies the difference? It is a well-known fact that certain chemical reactions are entirely different when taking place in an atmosphere of air or in an atmosphere of hydrogen. Certain reactions will only take place, or are greatly stimulated, by the presence of a catalyser, and while this latter does not enter into the reaction, its presence is essential. The one great difference between conditions in an oil gas set and the conditions in the carburetor of a water gas set is the atmosphere into which the oil is injected.

When the heating period is completed in an oil gas set, the interstices of the brick and the chambers are filled with carbonic acid and nitrogen, the products of combustion from the system heat oil, into which inert atmosphere the oil for gas making is injected. In the water gas carburetor it is entirely different. The oil is injected into an *active* atmosphere of carbon monoxide and hydrogen produced in the generator and passing through the carburetor; and this gas is the catalyser which prevents the destruction of the oil and the consequent waste of large quantities of uncombined carbon.

Here was a condition which could be reproduced in the oil gas generators. It was at first thought to attach a small water gas generator to one of the large oil gas sets; but this was not practical, as our endeavor was to eliminate the lampblack by-product, which would have been our only available solid fuel for the water gas generator.

We next endeavored to produce the desired result by purging for a minute one of the 16-foot Jones sets with steam before any oil was injected, which was done by admitting all available steam after the blast and stack valve were closed and the machine ready to make gas. A portion of this steam was dissociated and recombined with the fine particles of carbon remaining on the brick from the previous heating period, thus forming an active initial atmosphere.

The two following analyses sheets show the results of this test. Gas samples were taken from the primary and secondary shells, just above and below the common gas offtake, at the end of each consecutive minute. The temperature, quantity and quality of oil, as well as all other conditions, were as nearly identical as possible in these two runs, except that all available steam was turned into the set for one minute previous to the admission of any oil in Run No. 2. A comparison of the two runs shows a marked increase in the quality of the gas in the second run, especially the first few minutes. The marsh gas and illuminants were greatly increased, especially in the primary, and the carbon monoxide of the primary gas was considerably increased. These conditions were not due to any reduction in temperature, as the quantity of gas made in the second run was greater than in the first, and in both runs identically the same quantity of oil was used.

The following table shows the composition of oil gas made in the primary and secondary shells of generator 3 at the same time. The samples are taken at the end of each consecutive minute for a complete run of 10 minutes at an outlet of the primary just below the off-take and at the secondary just above it.

Run No. 1.

Minutes.	CO_2.	C_nH_{2n}.	C_2.	CO.	H_2.	CH_4.	N_2.
1—Primary...	6.2	0.6	6.0	15.4	27.9	17.9	26.0
Secondary	9.8	4.2	0.4	12.8	26.7	35.2	10.9
2—Primary...	3.4	0.6	0.8	15.6	54.9	23.9	0.8
Secondary	5.4	5.4	0.4	9.6	39.6	36.8	2.8
3—Primary..	2.6	1.2	0.6	14.6	48.6	27.0	5.4
Secondary	4.0	6.0	0.6	8.2	33.0	43.3	4.9
4—Primary...	2.2	1.2	0.6	14.6	48.9	28.1	4.4
Secondary	3.2	6.8	Tr.	7.4	39.5	41.3	1.8
5—Primary...	2.2	2.0	0.2	13.8	50.9	28.6	2.3
Secondary	2.6	6.8	0.2	7.4	37.8	41.5	3.7
6—Primary...	2.0	2.0	0.4	13.4	49.3	28.8	4.1
Secondary	2.2	8.0	0.4	6.0	38.9	41.7	2.8
7—Primary...	2.0	2.0	0.6	13.6	51.4	28.8	2.8
Secondary	2.0	7.8	0.2	6.6	38.9	41.7	2 8
8—Primary...	4.6	1.0	0.2	16.2	62.4	13.0	2.6
Secondary	2.2	8.0	1.0	6.0	42.3	38.6	1.9
9—Primary...	7.2	0.4	0.2	14.6	68.1	6.4	3.1
Secondary	3.8	6.8	0.6	8.2	47.6	30.2	2.8
10—Primary...	7.6	1.2	0.2	12.6	74.1	4.0	0.3
Secondary	5.4	5.6	0.2	10.4	52.3	22.2	3.9

The following table shows the composition of oil gas made in the primary and secondary at the same time. The samples were taken at the end of each consecutive minute for a run of 11 minutes at the outlet of the primary below the off-take and at the secondary above the off-take. During the first minute of the run no oil was used, but all the available steam was turned on in both shells.

Run No. 2.

Minutes.	CO_2.	C_nH_{2n}	O_2.	CO	H_2.	CH_2.	N_4.
2—Primary...	7.0	1.4	0.6	18.2	40.8	31.5	0.5
Secondary.	3.0	4.6	0.8	7.2	39.4	40.8	4.2
3—Primary...	4.2	2.4	0.4	15.8	41.2	32.2	3.8
Secondary.	2.8	6.0	0.4	6.2	41.7	41.3	2.4
4—Primary...	2.8	3.0	0.4	13.8	45.3	33.3	1.4
Secondary	2.2	6.0	0.4	6.0	44.6	39.8	1.0
5—Primary...	2.4	3.4	0.2	13.0	45.9	32.4	2.7
Secondary.	1.8	7.0	0.4	5.6	44.0	40.4	0.8
6—Primary...	2.4	3.2	0.4	11.6	42.1	37.1	3.2
Secondary.	1.6	7.4	0.4	5.4	43.5	41.1	0.6
7—Primary...	1.6	3.0	1.0	10.2	46.8	36.4	1.0
Secondary.	1.0	10.0	0.6	4.4	37.2	43.4	3.4
8—Primary...	2.2	3.2	0.6	10.2	38.2	40.5	5.1
Secondary.	1.0	8.8	0.8	4.0	45.9	36.6	2.9
9—Primary...	1.6	2.6	1.0	10.4	47.8	33.8	2.8
Secondary.	5.4	2.4	0.8	12.2	70.4	7.9	0.9
10—Primary...	3.6	2.6	0.8	14.0	50.9	22.4	5.7
Secondary.	8.0	2.4	0.6	13.4	63.8	7.6	4.2
11—Primary...	5.2	1.2	0.8	15.4	60.2	14.2	3.0
Secondary.	9.0	1.4	1.0	12.2	66.2	6 4	3.8

The initial atmosphere produced by the dissociation of the steam in first minute benefited materially the gas produced in the first few minutes of the run. To produce the desired results it is not sufficient to commence the destructive distillation of the oil in an initial atmosphere of an active gas or gases, but to continue in an atmosphere other than the gas produced by the machine from minute-to-minute. Natural gas under pressure would be ideal for the production of this catalytic atmosphere, but as no natural gas is available at the present time in San Francisco, our own oil gas, scrubbed, purified and ready for distribution, proved the best substitute, and it is this gas that is used to-day in the improved oil process. The idea of putting a finished, salable gas from the storage holders back into the generators may seem queer, to say the least; but I will endeavor to prove that it is not only not queer, but is quite the proper thing to do.

At this stage of our experiments the Metropolitan Company was acquired. The major portion of its generating equipment consisted of two oil gas units, comprising two-shell sets, both shells 15 feet in diameter by 39 feet high, connected at the bottom by a large, rectangular throat-piece. Each shell was equipped with a stack-valve and gas offtake at the top and heat burners at the bottom. The oil for gas making was injected at the top of one shell, passing downward through the neck and up the second shell. Each alternate run the direction was reversed. The small capacity of these sets, in comparison to their size, made a reconstruction necessary. The rebricking and rearrangement of these sets gave an ideal opportunity partially to test the merit of the new process.

In our estimation, the apparatus for the best results from this new process would be a two-shell set, a long and a short shell, connected at the bottom by an ample throat piece, the top of the latter being a blast inlet, that of the long shell the stack valve, the common gas offtake being located on the side of the long shell intermediate of its ends. The bricking and checkerwork had to be so arranged as to form double-chambers in the upper end of each shell. Short piers in the bottom of each shell support the main checkerwork, up about two-thirds the height of the short shell and three-fourths the height of the long shell. At this point open arches are sprung across the shell, forming the tops of the lower chambers and supporting the upper sets of checkerwork. About 12 courses of checkerwork rest on each of these arches, and the top of this checker with the corbel work forms the top chamber of each shell.

Into the top chamber of the primary or short shell extend the oil burners for heating the apparatus, connected to coils of pipe circling the shell. In the same manner, the injectors for admitting oil for gasmaking are connected into the lower primary and the lower secondary chamber. To the top chambers of each shell are connected gas lines for the admission of gas under pressure for producing the catalytic atmosphere. This supply is regulated by valves controlled from the operating floor. Into these top chambers also are steam connections for supplying steam for gasmaking and for purging. After the machine is properly heated and ready for a gasmaking period, the stack valve and blast valve are closed and the gas and steam under pressure are admitted into the top chambers of each shell. The accompanying drawing more clearly shows the idea.

During the first minute no oil is admitted, and all the products of

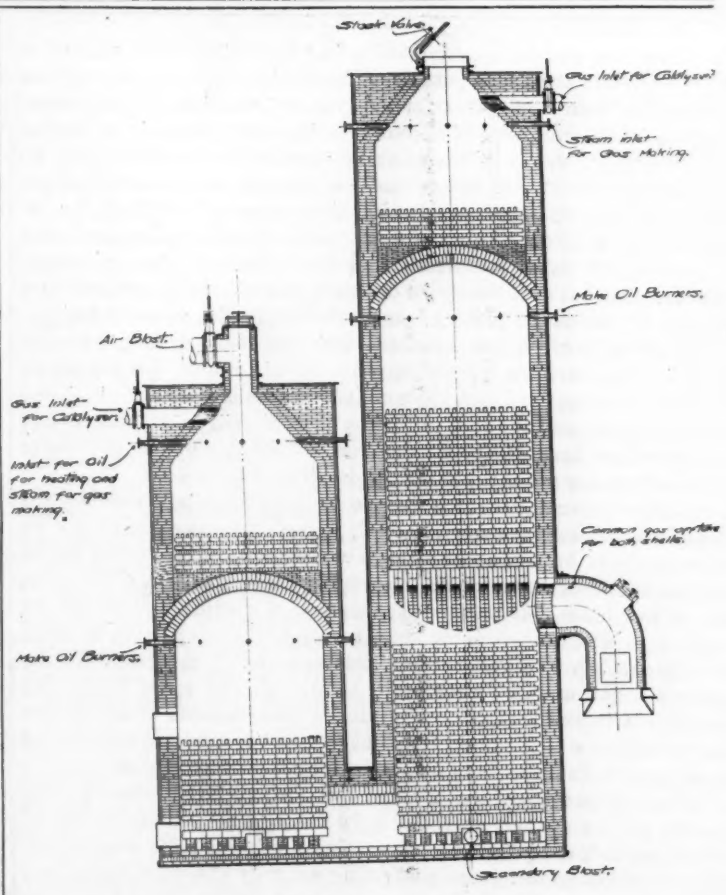
Stack Valve.
Gas Inlet for Cabbyson
Steam inlet for Gas Making.
Make Oil Burners.
Air Blast.
Gas Inlet for Cabbyson
Inlet for Oil for heating and Steam for gas making.
Common gas offtake for both shells.
Make Oil Burners.
Secondary Blast.

Fig. 1.—Improved "Jones" Oil Gas Set.

combustion from the previous heating period are purged from the machine. Thus, at the end of the first minute, when oil is admitted into the lower chambers of each shell, it comes in contact with an active atmosphere of gas and steam, highly superheated by passing through the upper section of the checkerbrick. The decomposition or destructive distillation of the oil, therefore, begins and is continued in an active atmosphere, and when the excess carbon is freed from the reforming of the hydrocarbons, it is surrounded by steam in a highly superheated condition, ideal for dissociation and combination with this carbon. It has long been the practice to admit the oil and steam for gasmaking together, and this practice to a large degree accounts for the variable temperatures to which the oil is subjected during the run. While the heat absorbed by the steam actually converted into gas is proportionately small, the heat absorbed by the total steam used, including the steam used to purge the machine after the run, is a large factor in the total heat absorption. In 1,000 cubic feet of average oil gas the steam actually converted in its production, based on the oxygen content seldom exceeds 6 lbs., while the actual steam used for injecting the oil is seldom less than 16 lbs., and the steam used to purge the machine in the last 3 minutes increases this amount to nearly 27 lbs. per 1,000 cubic feet. These figures are based on actual running conditions, tests showing that during a 10-minute run, in which 2,300 lbs. oil was injected in the first 7 minutes of the run, and the production was 40,000 cubic feet, the steam meter showed a consumption of 5,700 lbs. per hour, or 665 lbs. of steam during the run, and the steam used during the purge to be 8,000 lbs. per hour, or 400 lbs. during the purge. The heat, therefore, absorbed by the steam during the first 7 minutes was 14 per cent. of the total heat absorbed, and, during the entire run including the purge, the steam is accountable for 19 per cent. of the total heat loss or reduction in temperature—these figures are based on a specific heat of .6 and .305 for steam. It is not the loss of this heat, from the standpoint of monetary value of the added heat oil to regain this loss of temperature, which constitutes the error of this practice; but it is rather not giving the oil a square deal. The oil is continually being subjected to a decreasing temperature, and as the duration of the run must be sufficient to keep up the capacity and efficiency of the machine, the initial temperature must be above, or the final temperature below, that temperature which will produce both quality in gas and efficiency in results. The top chambers in the apparatus of the new process eliminate this fault to a great extent, the heat of the lower chambers being used exclusively for the breaking up of the oil, while

percentage of CO, showing the combustion to be more nearly com plete some distance from the initial point of combustion. The reason for the lack of stability of the heat in the checkerbrick nearest the stack is usually an economic one.

In order to minimize the loss of heat at the stack, the combustion should be regulated so that the maximum liberation of heat is in the central portion of the checkerwork, the checkerwork nearest the stack getting only the tail end of the combustion; and, while the brick attain a considerable temperature, they do not attain any great quantity of heat.

A result of these peculiar combustion conditions is the inverse variation of the temperatures in the two ends of a generator. If the combustion end is excessively hot the stack end will be proportionately cool. From this fact, the two-shell machine, with the gas off-take intermediate of the course of combustion in heating, derives its undisputed advantage over all other forms of generators, the natural balance of heat in the two shells maintaining a uniform quality and production of gas at all times.

In the 2-shell sets, where oil is injected with steam into the top chamber of both the long and short-shell, simultaneously, for gas making, and the gas off-take is located in the lower half of the long shell, the first temperature to which the oil is subjected is not the maximum temperature. The checkerbrick in the upper portion of each shell with which the oil first comes in contact do the greatest amount of work, and are the regulators which limit the quantity of oil per run; but the temperature of these brick does not constitute the fixing or superheating temperature to which the gas is subjected in the central portion of the long shell near the off-take. While the temperature in the upper portion of the checkerbrick in each shell to which the oil and steam are first subjected varies several hundred degrees F. during a run, the superheating or fixing temperature remains fairly constant.

The gas made during the entire run, therefore, is fixed at very nearly a uniform temperature, the gas made in the early part of a run being fixed instantly, while that made in the latter portion of the run requires a longer passage through the brick before being fixed.

In the past 10 years the art of manufacturing gas from crude oil has advanced rapidly, until to-day the modern oil gas is, without doubt, the most nearly ideal fuel, being superior in many respects to coal or water gas. The advancement has been not alone in the quality of the gas but equally in the efficiency of production, and oil gas (the infant industry) now compares favorably with the older methods as regards a comparison of production, raw material used and unchanged by-product. The coal gas man is forced to find a market for his by-product, while the oil gas man is more fortunate, as he may utilize the carbon by-product for the production of water gas and thus stay exclusively in the gas business. For several years, the large oil gas works have maintained water gas units for utilizing the lampblack, and thus practically all of the oil is eventually converted into gas; but this meant the duplication of a great deal of apparatus and duplicate handling of the raw material, first as oil, then the separation of the by-product and the handling as water gas fuel. The extra labor is excessively expensive when compared with the ideal oil gas, or the production of oil gas without the lampblack by-product. And it is thus along these lines (the combining into one process of what was accomplished in two) that the oil gas engineer has been working.

The first step was to study the existing conditions in the production of lampblack water gas. To attempt to reproduce in an oil gas set the conditions existing in the generator of a water gas set was apparently hopeless. The extreme temperature of the fuel bed, which makes the dissociation of steam and the conversion of most of the carbon to carbon monoxide possible, would be disastrous to the hydrocarbons of the oil, and (as a luminous high heat gas is still the requirement), the attempt to imitate the generator portion of the apparatus was given up. While the apparatus used in the production of water gas from lampblack is substantially the same as that employed when coal is used as the base, certain differences exist in operating conditions. The best results are obtained with an empty carburetor, using no checkerwork. The temperatures employed are higher and the time of contact proportionately less than when using coal. The same quality of oil is used for enriching the water gas as used in producing oil gas. The carburetor and superheater temperatures are nearly as great as those employed in oil gas, yet no lampblack is produced. Wherein lies the difference? It is a well-known fact that certain chemical reactions are entirely different when taking place in an atmosphere of air or in an atmosphere of hydrogen. Certain reactions will only take place, or are greatly stimulated, by the presence of a catalyser, and while this latter does not enter into the reaction, its presence is essential. The one great difference between conditions in an oil gas set and the conditions in the carburetor of a water gas set is the atmosphere into which the oil is injected.

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We next endeavored to produce the desired result by purging for a minute one of the 16-foot Jones sets with steam before any oil was injected, which was done by admitting all available steam after the blast and stack valve were closed and the machine ready to make gas. A portion of this steam was dissociated and recombined with the fine particles of carbon remaining on the brick from the previous heating period, thus forming an active initial atmosphere.

The two following analyses sheets show the results of this test. Gas samples were taken from the primary and secondary shells, just above and below the common gas offtake, at the end of each consecutive minute. The temperature, quantity and quality of oil, as well as all other conditions, were as nearly identical as possible in these two runs, except that all available steam was turned into the set for one minute previous to the admission of any oil in Run No. 2. A comparison of the two runs shows a marked increase in the quality of the gas in the second run, especially the first few minutes. The marsh gas and illuminants were greatly increased, especially in the primary, and the carbon monoxide of the primary gas was considerably increased. These conditions were not due to any reduction in temperature, as the quantity of gas made in the second run was greater than in the first, and in both runs identically the same quantity of oil was used.

The following table shows the composition of oil gas made in the primary and secondary shells of generator 3 at the same time. The samples are taken at the end of each consecutive minute for a complete run of 10 minutes at an outlet of the primary just below the off-take and at the secondary just above it.

Run No. 1.

Minutes.	CO_2.	C_nH_{2n}.	C_2.	CO.	H_2.	CH_4.	N_2.
1—Primary...	6.2	0.6	6.0	15.4	27.9	17.9	26.0
Secondary	9.8	4.2	0.4	12.8	26.7	35.2	10.9
2—Primary...	3.4	0.6	0.8	15.6	54.9	23.9	0.8
Secondary	5.4	5.4	0.4	9.6	39.6	36.8	2.8
3—Primary..	2.6	1.2	0.6	14.6	48.6	27.0	5.4
Secondary.	4.0	6.0	0.6	8.2	33.0	43.3	4.9
4—Primary...	2.2	1.2	0.6	14.6	48.9	28.1	4.4
Secondary.	3.2	6.8	Tr.	7.4	39.5	41.3	1.8
5—Primary...	2.2	2.0	0.2	13.8	50.9	28.6	2.3
Secondary.	2.6	6.8	0.2	7.4	37.8	41.5	3.7
6—Primary...	2.0	2.0	0.4	13.4	49.3	28.8	4.1
Secondary.	2.2	8.0	0.4	6.0	38.9	41.7	2.8
7—Primary...	2.0	2.0	0.6	13.6	51.4	28.8	2.8
Secondary	2.0	7.8	0.2	6.6	38.9	41.7	2 8
8—Primary...	4.6	1.0	0.2	16.2	62.4	13.0	2.6
Secondary.	2.2	8.0	1.0	6.0	42.3	38.6	1.9
9—Primary...	7.2	0.4	0.2	14.6	68.1	6.4	3.1
Secondary.	3.8	6.8	0.6	8.2	47.6	30.2	2.8
10—Primary...	7.6	1.2	0.2	12.6	74.1	4.0	0.3
Secondary.	5.4	5.6	0.2	10.4	52.3	22.2	3.9

The following table shows the composition of oil gas made in the primary and secondary at the same time. The samples were taken at the end of each consecutive minute for a run of 11 minutes at the outlet of the primary below the off-take and at the secondary above the off-take. During the first minute of the run no oil was used, but all the available steam was turned on in both shells.

Run No. 2.

Minutes.	CO_2.	C_nH_{2n}	O_2.	CO	H_2.	CH_4.	N_4.
2—Primary...	7.0	1.4	0.6	18.2	40.8	31.5	0.5
Secondary.	3.0	4.6	0.8	7.2	39.4	40.8	4.2
3—Primary...	4.2	2.4	0.4	15.8	41.2	32.2	3.8
Secondary.	2.8	6.0	0.4	6.2	41.7	41.3	2.4
4—Primary...	2.8	3.0	0.4	13.8	45.3	33.3	1.4
Secondary	2.2	6.0	0.4	6.0	44.6	39.8	1.0
5—Primary...	2.4	3.4	0.2	13.0	45.9	32.4	2.7
Secondary.	1.8	7.0	0.4	5.6	44.0	40.4	0.8
6—Primary...	2.4	3.2	0.4	11.6	42.1	37.1	3.2
Secondary.	1.6	7.4	0.4	5.4	43.5	41.1	0.6
7—Primary...	1.6	3.0	1.0	10.2	46.8	36.4	1.0
Secondary.	1.0	10.0	0.6	4.4	37.2	43.4	3.4
8—Primary...	2.2	3.2	0.6	10.2	38.2	40.5	5.1
Secondary.	1.0	8.8	0.8	4.0	45.9	36.6	2.9
9—Primary...	1.6	2.6	1.0	10.4	47.8	33.8	2.8
Secondary.	5.4	2.4	0.8	12.2	70.4	7.9	0.9
10—Primary...	3.6	2.6	0.8	14.0	50.9	22.4	5.7
Secondary.	8.0	2.4	0.6	13.4	63.8	7.6	4.2
11—Primary...	5.2	1.2	0.8	15.4	60.2	14.2	3.0
Secondary.	9.0	1.4	1.0	12.2	66.2	6 4	3.8

The initial atmosphere produced by the dissociation of the steam in first minute benefited materially the gas produced in the first few minutes of the run. To produce the desired results it is not sufficient to commence the destructive distillation of the oil in an initial atmosphere of an active gas or gases, but to continue in an atmosphere other than the gas produced by the machine from minute-to-minute. Natural gas under pressure would be ideal for the production of this catalytic atmosphere, but as no natural gas is available at the present time in San Francisco, our own oil gas, scrubbed, purified and ready for distribution, proved the best substitute, and it is this gas that is used to-day in the improved oil process. The idea of putting a finished, salable gas from the storage holders back into the generators may seem queer, to say the least; but I will endeavor to prove that it is not only not queer, but is quite the proper thing to do.

At this stage of our experiments the Metropolitan Company was acquired. The major portion of its generating equipment consisted of two oil gas units, comprising two-shell sets, both shells 15 feet in diameter by 39 feet high, connected at the bottom by a large, rectangular throat-piece. Each shell was equipped with a stack-valve and gas offtake at the top and heat burners at the bottom. The oil for gas making was injected at the top of one shell, passing downward through the neck and up the second shell. Each alternate run the direction was reversed. The small capacity of these sets, in comparison to their size, made a reconstruction necessary. The rebricking and rearrangement of these sets gave an ideal opportunity partially to test the merit of the new process.

In our estimation, the apparatus for the best results from this new process would be a two-shell set, a long and a short shell, connected at the bottom by an ample throat piece, the top of the latter being a blast inlet, that of the long shell the stack valve, the common gas offtake being located on the side of the long shell intermediate of its ends. The bricking and checkerwork had to be so arranged as to form double-chambers in the upper end of each shell. Short piers in the bottom of each shell support the main checkerwork, up about two-thirds the height of the short shell and three-fourths the height of the long shell. At this point open arches are sprung across the shell, forming the tops of the lower chambers and supporting the upper sets of checkerwork. About 12 courses of checkerwork rest on each of these arches, and the top of this checker with the corbel work forms the top chamber of each shell.

Into the top chamber of the primary or short shell extend the oil burners for heating the apparatus, connected to coils of pipe circling the shell. In the same manner, the injectors for admitting oil for gasmaking are connected into the lower primary and the lower secondary chamber. To the top chambers of each shell are connected gas lines for the admission of gas under pressure for producing the catalytic atmosphere. This supply is regulated by valves controlled from the operating floor. Into these top chambers also are steam connections for supplying steam for gasmaking and for purging. After the machine is properly heated and ready for a gasmaking period, the stack valve and blast valve are closed and the gas and steam under pressure are admitted into the top chambers of each shell. The accompanying drawing more clearly shows the idea.

During the first minute no oil is admitted, and all the products of

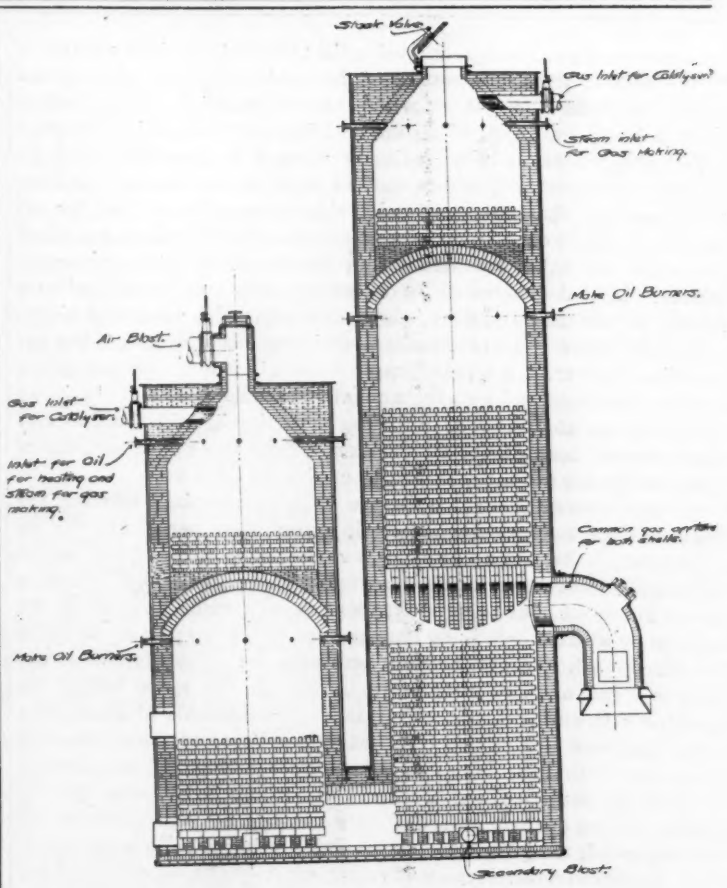
Stack Valve.
Gas Inlet for Catalyzer.
Steam inlet for Gas Making.
Make Oil Burners.
Air Blast.
Gas Inlet for Catalyzer.
Inlet for Oil for heating and Steam for gas making.
Common gas offtake for both shells.
Make Oil Burners.
Secondary Blast.

Fig. 1.—Improved "Jones" Oil Gas Set.

combustion from the previous heating period are purged from the machine. Thus, at the end of the first minute, when oil is admitted into the lower chambers of each shell, it comes in contact with an active atmosphere of gas and steam, highly superheated by passing through the upper section of the checkerbrick. The decomposition or destructive distillation of the oil, therefore, begins and is continued in an active atmosphere, and when the excess carbon is freed from the reforming of the hydrocarbons, it is surrounded by steam in a highly superheated condition, ideal for dissociation and combination with this carbon. It has long been the practice to admit the oil and steam for gasmaking together, and this practice to a large degree accounts for the variable temperatures to which the oil is subjected during the run. While the heat absorbed by the steam actually converted into gas is proportionately small, the heat absorbed by the total steam used, including the steam used to purge the machine after the run, is a large factor in the total heat absorption. In 1,000 cubic feet of average oil gas the steam actually converted in its production, based on the oxygen content seldom exceeds 6 lbs., while the actual steam used for injecting the oil is seldom less than 16 lbs., and the steam used to purge the machine in the last 3 minutes increases this amount to nearly 27 lbs. per 1,000 cubic feet. These figures are based on actual running conditions, tests showing that during a 10-minute run, in which 2,300 lbs. oil was injected in the first 7 minutes of the run, and the production was 40,000 cubic feet, the steam meter showed a consumption of 5,700 lbs. per hour, or 665 lbs. of steam during the run, and the steam used during the purge to be 8,000 lbs. per hour, or 400 lbs. during the purge. The heat, therefore, absorbed by the steam during the first 7 minutes was 14 per cent. of the total heat absorbed, and, during the entire run including the purge, the steam is accountable for 19 per cent. of the total heat loss or reduction in temperature—these figures are based on a specific heat of .6 and .305 for steam. It is not the loss of this heat, from the standpoint of monetary value of the added heat oil to regain this loss of temperature, which constitutes the error of this practice; but it is rather not giving the oil a square deal. The oil is continually being subjected to a decreasing temperature, and as the duration of the run must be sufficient to keep up the capacity and efficiency of the machine, the initial temperature must be above, or the final temperature below, that temperature which will produce both quality in gas and efficiency in results. The top chambers in the apparatus of the new process eliminate this fault to a great extent, the heat of the lower chambers being used exclusively for the breaking up of the oil, while

the steam and gas are superheated to the temperature of the apparatus by the brick in the upper portion of the machine before entering the gasmaking chambers. Thus, where the reformation of the hydrocarbons leaves an excess of carbon in a free state, steam in a highly superheated condition is immediately present for combination. To entirely exclude steam, except under a high degree of superheat from the gasmaking chambers, gas under high pressure is utilized for injecting the make oil. In some works, where high pressure gas is not available, the cost of compression for this use alone might prove excessive. In that case the steam on the injectors may be reduced to a minimum, the major portion being admitted in the upper chambers.

The addition of the top chambers and checkerbrick above the gas making chambers is a marked improvement in itself. Besides superheating the steam and gas, these chambers are the means of obtaining a uniform substantial heat in the lower portion of each shell, as any sharp surface heat, due to combustion, affects the upper sections of brick which are not utilized for the distillation of the oil.

Another material benefit is the use of large chambers between the top of the checkerwork and the oil injectors, thus permitting the oil to be partially broken up or at least vaporized by radiated heat before coming in direct contact with the brick. This is not only a benefit to the oil and brick, but permits the heat of a greater number of the brick to be utilized before the temperature of the top portion of brick is reduced below a gas making temperature. The practice of the early oil gas man, of attempting to fill all the space within his machine with checkerbrick, accounts for considerable of the carbon accumulation which caused frequent shutdowns and many hours of blasting to burn out. This was caused by injecting the oil directly on to the top courses of the checkerbrick, which brick soon lost the greater portion of their heat, and only the lighter portion of the oil was vaporized, the heavier portion accumulating in solid mass of carbon. Another factor, greatly affecting not only the condition of the machine but the efficiency of the results and quality of the gas, is the injector or means of introducing the oil into the generators. This subject was the basis of a series of recent experiments, and various types and means of admitting oil were thoroughly tested. Many styles of vaporizers or injectors have been used with varying degrees of success, but in every case the vaporizer is located just inside the coil, the vaporized oil and steam being conveyed to the machine through pieces of pipe extending through the lining. The result of these tests showed that the greatest fault was not the vaporizer proper, but the means of conveying or the treatment after vaporization. After testing many various types of vaporizers, it was found that most of them gave an almost perfect oil-fog at the tip or outlet, when the steam pressure was maintained about 5 pounds more than the oil pressure.

When sections of ¾-inch pipe, such as those used to convey the oil through the lining, were screwed onto these burners, a large portion of this oil-fog was condensed. Various sizes and lengths of pipe were then tried. The length made no material difference, but the only size with which efficient results were attained was found to exactly conform to the size of the end of the tip in the ejector. It also worked equally well with ½-inch pipe, or even larger, if the end or tip was reduced to an orifice to conform to the area of the ejector. The best results with the ejector of the Hayden & Derby type, most commonly used, was with ¾-inch pipe, capped with a ¾-inch to ½-inch reducer, through which a ¼-inch drill had been previously run to remove the threads. Apparently, therefore, the one essential requirement in injecting oil is to maintain the velocity after vaporizing until it reaches the machine.

While the basic principles of the destructive distillation of oil, and the temperature conditions existing within the machines, have been the subject of first importance and greatest thought, the lesser refinements and mechanical improvements have all aided materially in obtaining better results.

In speaking of the effect of various temperatures on certain oils and the resultant gas, reference is only made to the quality of the heat. The quantity of heat, or time to which the oil or gas is subjected to any temperature, is a factor which has been entirely overlooked in oil gas practice. The quantity of heat or time of contact is of as great importance as the temperature or quality, for upon the one depends the effectiveness of the other. Many conditions affect the time of contact factor, the area and length of the machine, the number and arrangement of the checkerbrick and the rate of production of the generator, which factors constitute the velocity of the gas. Widely different results may be obtained when the same temperature is utilized for oil gas making and the velocity or time of contact varies. Likewise, similar results may be obtained when the temperature varies within certain ranges and the velocity is increased or decreased to suit. To produce similar results, an increase in temperature requires an increase in velocity or decrease in time of contact. The temperature (to a certain extent) influences the velocity, and to this reason may be attributed the fact that its importance was not sooner realized. If a machine is excessively hot a larger quantity of gas is produced, increasing the velocity and, therefore, is subjected to the heat for a shorter period of time. The expansion of the gas due to temperature also tends to maintain a balance between the temperature and velocity, but as there is no proportionate relation between temperature and time of contact, both factors must be considered.

The construction of oil gas generators in the past has been based largely upon the results obtained by some other apparatus in use, and very little thought has been given to the reason for the vastly different results obtained in the different types of machines. Seldom are like results attained in different sizes of machines of the same type. With the introduction of indicating and recording pyrometers, steam meters and gauges, and the supplanting with accurate knowledge the guesswork of the past, we are approaching the subject from a more scientific viewpoint.

In order to demonstrate the effect of velocity (or time of contact) on the gas, 5 runs were made on the No. 4 set at the Metropolitan works. At the time this set was rebuilt it was deemed advisable to more fully test the new method before making any radical changes. As the two shells of this set were of the same length, only the primary shell was equipped with the upper chamber and double set of checkerbrick, with the idea of adding the upper chamber to the secondary at some future time, should the tests be successful. This set is only mechanically complete in one shell; in all other respects it is all that could be desired for testing the ideas of this new method. In the 5 runs referred to it was endeavored to maintain all conditions (other than the time of contact or velocity) the same. This was accomplished by increasing the duration of each run. The first run was of 10 minutes' duration; the second, 11; the third, 12; the fourth, 13; the fifth, 14 minutes. In each run the first minute was devoted to purging with gas, the last three minutes to purging with steam. Thus only the time required to introduce the oil was increased, and in each run practically the same amount of oil was used. At the end of each minute, gas samples were taken at the washbox, temperature and oil readings were taken, and the gas measured in the relief holder. The purge gas used was measured by a station meter.

The following tables give the analysis and quantity of gas made in

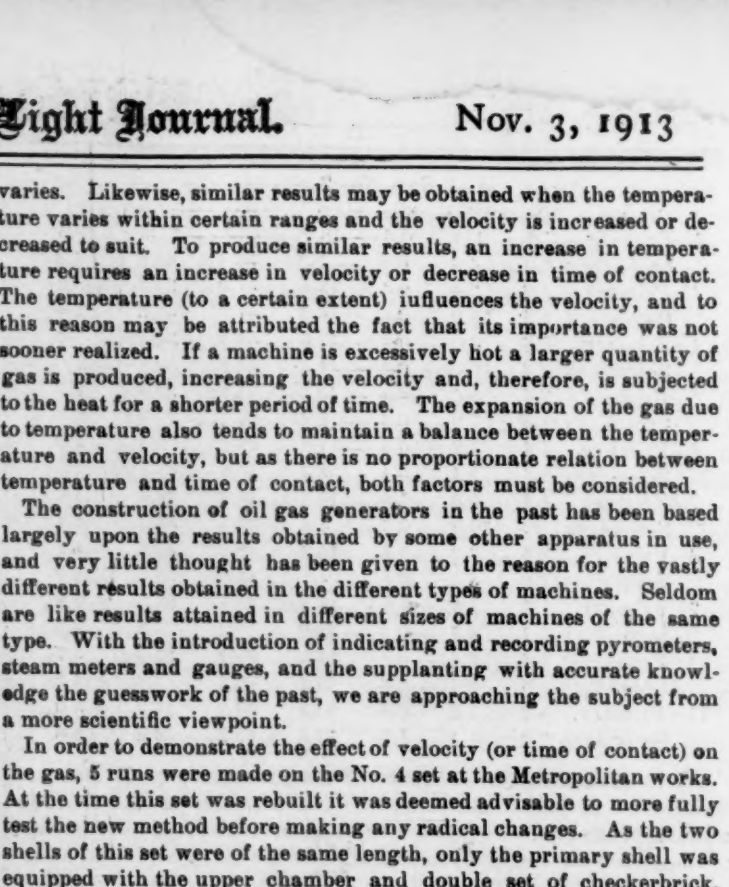

Fig. 2.—Chart Showing Relation of Purge Gas CO, H_2 and CH_4. Velocity Test Nos. 5, 8, 7, 13.

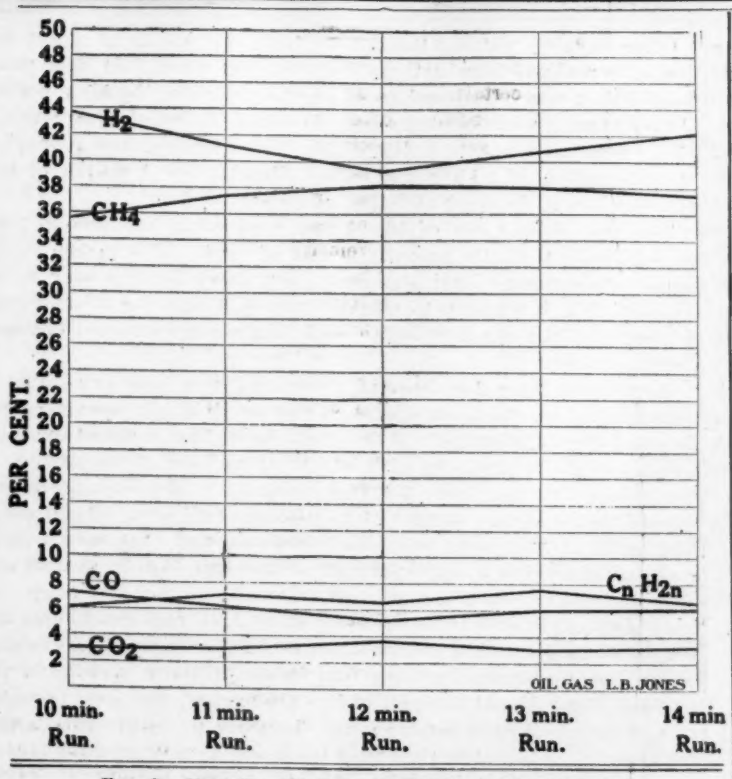

Fig. 3.—Chart Showing Effect of Velocity on Quality of Gas.

each minute of each run, and all the conditions affecting the runs. The average analyses for the run are based on the analysis and make of each minute. The increase in time of contact, by the increase in duration of the run from 10 to 12 minutes, shows a marked increase in the quality of the gas.

The illuminants were increased 1 per cent., the methane, 1.8 per cent., the hydrogen was decreased and the heating value increased by 27 B.T.U.'s. The increase from 6 to 7 minutes (in which time the oil was injected), would constitute an increase in time of contact of 16 per cent., but as 8 per cent. more gas was made in the 11-minute run, the actual increase amounts to only 8 per cent.

A slight increase in methane is counteracted by a decrease in illuminants in the twelfth minute, from then the methane decreases and the hydrogen also increases with an increase in time of contact. Very little benefit is derived by the increase after 11, possibly 12 minutes, and the velocity of the gas in the 11th minute might be considered as proper in proportion to the temperature for this machine. The time of contact should be regulated in the construction of the generator by the length of shell or arrangement of checkerwork, for any increase in length of run decreases the daily capacity of the machine. The practice of forcing machines to their fullest capacity is common to the oil gas man. Every machine has a capacity where efficiency and quality of gas may be combined, but if the machine is forced one or the other is sacrificed. When these tests were first undertaken, with the idea of converting a greater percentage of the carbon of the oil into gas, it was the belief that this carbon would combine with the steam used and appear in the gas as carbon monoxide.

While the gas made by the new method embraces a larger part of the carbon of the oil, the carbon monoxide content is lower than in the gas made the usual way. The conditions for the production of carbon monoxide are equally as good, and in fact superior. The temperature is sufficient, as a large quantity of carbon monoxide is produced in the last 3 minutes of the run after the oil is shut off; in fact, there is no good reason to believe that carbon monoxide is not formed, and this leads to the belief that it is formed and combined after formation. We are thus forced to consider the production of methane or marsh gas synthetically.

Several years ago such a suggestion would have been tabooed; but, since the experiments of eminent chemists have proven the theory and have produced methane or marsh gas synthetically, we must seriously consider its production on a practical scale. A great many of the experiments conducted by these chemists in the production of synthetic marsh gas have been in conjunction with a study of catalysis, and in this respect our experiments of a highly practical order have paralleled those theoretical or laboratory experiments. In "Bulletin 7," Department of the Interior, the authors quote the experiments of Mayer, Henseling and V. Altmeyer, as described in the *Journal fuer Beleuchtung* (Vol. 52), as follows:

"By passing a mixture of carbon dioxide, or carbon monoxide and hydrogen, over a catalyser of finely divided nickel or cobalt, heated to 200° to 500° C. (392° to 932° F.), these investigators have obtained large quantities of methane—50 to 60 per cent. Under favorable conditions, the carbon monoxide could be completely reduced to methane. By passing hydrogen over carbon, which had previously been deposited on the nickel catalyser, a gas containing over 90 per cent. of marsh gas was obtained at a temperature of 245° C. (473° F.)

"While at temperatures between 200° and 500° C., these reactions take place only under the influence of a catalyser, it is not improbable that, at higher temperatures, they may take place without a catalyser."

In view of the fact that, at the temperature employed in the velocity tests described, the formation of carbon dioxide from steam and carbon, and the reaction from carbon dioxide to carbon monoxide, are very sluggish, all reasoning would lead to the conclusion that an increase in the time of contact in the runs in which the velocity was decreased would produce a greater percentage of carbon dioxide and carbon monoxide.

In all probability this is true, and more carbon monoxide was produced, but was utilized for the production of synthetic marsh gas. There are several equations which might be followed in the eventual conversion of carbon and steam into marsh gas; but, from the ratio of the constituents of the gas, the probable equation is as follows:

$$2H_2O + C = 2H_2 + CO_2.$$
$$CO_2 + C = 2CO.$$
$$2CO + 4H_2 = 2CH_4 + O_2.$$
$$O_2 + C = CO_2.$$

It has always been the theory that marsh gas was purely the result of destructive distillation of the oil, and this is undoubtedly true of the larger portion appearing in the gas, but the exceptionally large quantity of marsh gas in the gas of the new process upholds the theory of its production synthetically.

From the foregoing reaction, an increase in marsh gas would be accompanied by an equal decrease in carbon monoxide, an increase of ½ as much carbon dioxide and a decrease of twice as much hydrogen. Reference to the average analyses of the runs of the velocity test shows this to be true. A comparison of the 10-minute run with the 12-minute run shows:

	Per Cent.
Increase in marsh gas	2.6
Decrease in carbon monoxide	2.2
Decrease in hydrogen	4.4
Increase in carbon dioxide	0.6

Comparing the 10 with the 11-minute run shows:

	Per Cent.
Increase in marsh gas	1.8
Decrease in carbon monoxide	1.1
Decrease in hydrogen	2.5
Increase in carbon dioxide	0.1

In order to prove beyond the possibility of doubt that marsh gas is being produced synthetically, it would be necessary to have the hydrogen content of the illuminants and marsh gas combined greater than the hydrogen content of the oil. Such proof would be indisputable, but such gas has not to my knowledge been produced. However, it is reasonable to suppose that, as the carbon and hydrogen are linked in the oil, the destructive distillation of the oil resulting in the liberation of carbon in a free state also results in the liberation of some hydrogen in a free state. This is undoubtedly true, as the hydrogen from steam based on the oxygen content seldom exceeds 35 per cent. of the free hydrogen of the gas.

Upon the theory that uncombined carbon, or the carbon of the oil, less the carbon in the gas bears some practical relation to the free hydrogen of the gas, 10 samples of gas from the old method were tested. These samples showed an average proportion of 22.5 to 1, in a comparison of weight of uncombined carbon vapor and hydrogen. In no sample did the proportion fall below 21.3, or exceed 23.3 to 1; 22.5 then might be considered a fair average relation, but only on this type of machine and under the same running conditions. Undoubtedly the entire marsh gas content of the oil gas made by the old method is solely the result of the distribution of the oil. The hydrogen content, therefore, of the gas represents the maximum liberation of free hydrogen.

As the general running conditions of the new and old method are similar, it is permissible to apply this proportion to the new process. Let us consider the 10-minute run of the velocity test. After we make proper deductions from the total oil for .5 gallon of tar per 1,000 feet, we find 46.51 lbs. of carbon introduced. The gas contained 18.417 lbs. of carbon, leaving as uncombined 28.09 lbs. of carbon. Applying our proportion theory to this quantity of uncombined carbon, we find the hydrogen content of the gas derived from the oil to be 39.4 per cent. From the oxygen content of the gas we find the hydrogen content from steam to be 13.3 per cent., or a total hydrogen content of 52.7 per cent. The gas by analysis showed only 43.7 per cent. hydrogen; therefore, 9 per cent. of the freed hydrogen had been recombined and appeared in the gas as marsh gas.

This same theory applied to the 11-minute run shows 8.9 per cent. of hydrogen to have been converted into marsh gas, and 11.2 per cent. in the 13-minute run. If we deduct the percentage of marsh gas formed synthetically, and deduct equally for carbon monoxide from the analysis of the 10-minute run, and add to the hydrogen and carbon dioxide, in proportion to the equation of its formation, we have the following comparison:

	Gas Analysis of 10-Minute Run.	Same Analysis Stripped of Synthetic Marsh Gas.
CO_2	3.0	0.8
C_nH_n	6.1	5.8
O_2	0.0	0.0
CO	7.3	11.0
H_2	43.7	50.0
CH_4	35.6	29 1
N_2	4.3	3.3

The second analysis is reduced slightly in all its constituents as the volume of the marsh gas formed was not equal to the original volume of its components. The second analysis, stripped of its synthetic marsh gas, is a typical analysis of the gas produced in the old process. To more clearly show the positive effect of the catalytic atmosphere on the quality of the gas, and especially on the production of the marsh gas, a curve has been plotted of the constituents of the gas each minute of the 14-minute run. The gas used for the catalytic atmosphere dropped twice during this run from 700 to 600 cubic feet per minute, and these drops, in the third and eighth minute, affected materially the gas produced in the following minutes.

The oil used per 1,000 cubic feet of gas made in the new process is not at the present time much less than in the old method, but the gas is far superior. The production of synthetic marsh gas in an oil gas set opens great possibilities for the future oil gas, for with the eventual abolition of the candle power standard, it marks the way to the production of a high heat unit gas with very little candle power at a reduced cost.

While the gas of the new process embraces 15 per cent. more carbon than the gas of the old method, this amount only constitutes 5 per cent. more of the total carbon used. The average carbon content in 1,000 cubic feet of the old oil gas is 17 pounds, and in the gas of the new process 19½ pounds. While this is a considerable increase there is vast room for improvement. In order to produce a gas of the quality of that made in the 10-minute run shown, without any by-products of lampblack or tar and no loss of carbon at the stack, 1,000 cubic feet of gas would have to be produced from 21.6 pounds (or 2.7 gallons) of oil. This, of course, would represent 100 per cent. efficiency. If the lampblack were eliminated and the loss at the stack stopped, and we still produced ½ gallon tar and the same quality of gas, 1,000 cubic feet would then have to be produced from 25.7 pounds (or 3.2 gallons) of oil. It appears, from these figures, that, while great progress has been made in the efficiency of production of oil gas, we are still far from what might be considered good efficiency; as a matter of fact, in the best results yet attained, the carbon of the gas represents less than 40 per cent. of the carbon of the oil. These figures are based on actual carbon used as oil and carbon in the gas, and may seem low to one who is accustomed to compare the carbon in the gas with the lampblack by-product. In the new process, as well as the old, the actual carbon, accounted-for as gas, lampblack and tar, seldom exceeds 60 per cent. of the carbon of the oil, and the greatest loss of carbon is at the stack of which no account is kept.

The troubles with carbon accumulating in the early oil gas generators is responsible for the practice (which still prevails) of blowing the machine before each heating period. After the run is taken off all the available air at the greatest available pressure is turned into the machine for 3 minutes, at the end of which time, the air is reduced and oil turned in for heating. During the run there is a slight accumulation of carbon on every checkerbrick, and during the blow the greater portion of this is wasted.

Often have we watched the sparks from our stacks at night, but few have realized that, in those tiny sparks, more fuel was being wasted than was introduced as oil in the following heating period. On the operation of the old process, in which 20 lbs. of lampblack of 55 per cent. moisture, or 11 lbs. of dry, are recovered, and approximately 7½ gallons of oil are used, after allowing for ½ gallon of tar, shows a loss at the stack of 20 lbs. of carbon per 1,000.

This amount in a run of 50,000 feet production amounts to 1,000 pounds, or 2½ times the amount of heat oil used. This carbon in the aggregate is of considerable amount; but, when divided over 30,000 checkerbrick, it amounts to slightly over ½ ounce per brick, which represents a film one-thousandth inch thick on the exposed checkerbrick surface.

Apparently there is no hope of preventing this loss, as it must be cleared from the machine after each run, or it would soon accumulate and form a stoppage. If this could be stopped, a gas of the same quality might be produced with the same volume of by-product of lampblack and tar from 4.4 gallons of oil. This loss, therefore, represents the carbon content of 2.6 gallons of oil per 1,000. It seems impossible at the present time to stop the loss, and thus save a large quantity of oil, but a large portion of the loss can be utilized and thus will not represent a total loss. The carbon accumulation not only amounts to over twice the amount of fuel required to heat the generator each run, but is distributed evenly throughout the checkerwork, and this presents an ideal fuel for the uniform heating of the checkerbrick. Equal amounts of fuel are burned and heat liberated on the surface of each checkerbrick. In order to utilize this carbon for heating the set, after the run is taken off, a very small quantity of air is introduced into several points in the set. Besides the carbon on the brick, this method utilizes the greater portion of the gas remaining in the machine from the previous run, which amounts to over 3,000 cubic feet on the large sets of a gas of over 350 B.T.U.s, or over a million heat units, equal to nearly 7 gallons of oil. This not only utilizes a large volume of heat which is now lost, but also eliminates the smoke nuisance of a gas works, which at the present time is attracting considerable attention. With a few such refinements, the oil gas works of the future may be considered a desirable neighbor rather than a nuisance.

This new method of heating has only been introduced and practically demonstrated at the Metropolitan plant within the past few weeks. No radical changes were made in introducing this method, but it was endeavored rather to gradually reduce the quantity of heat oil, until a point was reached where a loss in temperature or an increase in time required to heat would make further reduction false economy.

At the present time, the first 5 minutes of the heat are devoted to burning the gas and carbon in the machine with a very light blast, the remaining 5 minutes, oil is used. In this way, the heat oil has already been reduced 45 per cent. or over ½ gallon per 1,000 cubic feet of gas. While this, and a possible greater, reduction, until little or no heat is used, is of great importance; a feature of perhaps greater importance is the quality of the heat produced. Before this new method of heating was introduced, and oil was used exclusively for heating, the drop in temperature of the checkerbrick, just below the primary and secondary make chambers during a run, was seldom less than 250° F. With the new method, using the same quantity of oil during the run, the drop seldom exceeds 100° F. This shows that a far more substantial and uniform heat is produced.

In all of the experiments described, a distillate of about 18° B. was used, and undoubtedly better results could have been obtained with crude oil. The Metropolitan works is not an experimental plant, but is one of the large producers for the supply of San Francisco. While this plant produces over 3 millions feet per day, at no time has the lampblack and tar by-product been more than sufficient for boiler fuel.

APPENDIX.

Experimental Runs with Analysis Sheets.

Run No. 1.—No. 4 Jones Set, Metropolitan Works: 11 A.M., *August 2, 1913.*

Minutes.	Gross Make.	Purge Gas.	Net Make.	Prim. Oil.	Sec. Oil.	Total Oil.	Prim. Temp. Degs. F.	Sec. Temp. Degs. F.	Neck Temp. Degs. F.
0.....	.....	....	....	....	....	....	1,610	1,460	1,670
1.....	1,576	800	776	....	....	....	1,580	1,400	1,670
2.....	4,202	800	3,402	15.5	14.5	30.0	1,550	1,310	1,680
3.....	6,531	700	5,831	25.2	25.2	50.4	1,520	1,210	1,670
4.....	6,531	700	5,831	21.5	23.3	44.8	1,510	1,180	1,670
5.....	5,914	800	5,114	21.4	22.4	43.8	1,490	1,150	1,670
6.....	5,892	800	5,092	20.5	23.3	43.8	1,480	1,120	1,660
7.....	5,366	800	4,566	15.7	20.3	36.0	1,480	1,100	1,660
8.....	4,133	200	3,933	10.9	10.0	20.9	1,480	1,110	1,660
9.....	1,553	....	1,553	....	....	....	1,480	1,130	1,650
10.....	617	....	617	....	....	....	1,480	1,160	1,650
	42,315	5,600	36,715	130.7	139.0	269.7	.....	.....	.....

	Gallons.	Gallons per 1,000.
Make, oil	269.7	= 7.34
Heat, oil	46.7	= 1.26
Total oil	316.4 gallons	= 8.60

Net gas made.....36,715 cubic feet.

Analysis Sheet.

Mins.	Net Make.	CO_2.	CnH_2N.	O_2.	CO.	H_2.	CH_4.	N_2.	Sp. Gr.	B.T.U.
1..	776	23.2	0.3	....	9.5	5.2	18.4	43.4	.975	258
2..	3,402	3.3	4.9	....	8.4	43.1	36.1	4.2	.451	665
3..	5,831	1.8	5.5	....	6.7	44.4	38.0	3.6	.422	694
4..	5,831	1.5	6.1	....	6.0	43.2	39.6	3.6	.425	717
5..	5,114	1.4	7.0	....	5.6	42.1	40.1	3.8	.432	734
6.	5,092	1.3	7.8	....	4.9	41.6	40.9	3.5	.433	755
7..	4,566	1.3	8.1	....	4.8	40.5	41.5	3.8	.441	762
8..	3,933	4.1	5.8	....	11.3	50.4	25.6	2.8	.433	603
9 .	1,553	11.0	2.0	....	17.0	61.1	8.2	0.7	.428	396
10..	617	13.0	1.5	...	16.9	59.4	6.9	2.2	.478	369
Total	36,715	....	....	....	....	....	....	...	....	....
Av. analysis.		3.0	6.1	....	7.3	43.7	35.6	4.3	.445	679

Run No. 2.—No. 4 Jones Set, Metropolitan Works: 11:20 A.M., *August 2*, 1913.

Minutes.	Gross Make.	Purge Gas.	Net Make.	Prim. Oil.	Sec. Oil.	Total Oil.	Prim. Temp. Degs. F.	Sec. Temp. Degs. F.	Neck Temp. Degs. F.
0....	.....	....	....	....	....	....	1,600	1,420	1,680
1.....	1,419	800	619	....	..	....	1,580	1,370	1,680
2.....	2,580	800	1,780	19.6	21.5	41.1	1,560	1,320	1,670
3.....	5,640	700	4,940	16.8	23 3	40.1	1,550	1,210	1,670
4.....	6,280	700	5,580	20.5	24.3	44 8	1 530	1,150	1,670
5.....	6,028	800	5,228	19.6	19.6	39.2	1,500	1,120	1,670
6.....	5,572	700	4,872	15 8	22.4	38.2	1,500	1,100	1,660
7.....	5,317	700	4,617	19.6	24.2	43.8	1,490	1,080	1,660
8.....	5,707	800	4,907	18.6	24.2	42.8	1,480	1,060	1,650
9.....	4,561	300	4,261	....	..	....	1,480	1,060	1,650
10.....	2,024	....	2,024	....	....	....	1,480	1,080	1,650
11.....	781	...	781	....	....	....	1,480	1,100	1,650
	45,909	6,300	39,609	130.5	159.5	290.0	.....	.....	.....

	Gallons.	Gallons per 1,000.
Make, oil	290.9	= 7.3
Heat, oil	46.7	= 1.2
Total oil	336.7 gallons	= 8.50

Net gas made.....39,609 cubic feet.

Analysis Sheet.

Mins.	Net Make.	CO_2.	CnH_2N.	O_2.	CO.	H_2.	CH_4.	N_2.	Sp. Gr.	B.T.U.
1....	619	20.3	0.0	1.0	5.7	No explosion		73.0	1.082	20
2....	1,780	9.0	3.0	0.0	15.0	45.0	24.3	3.7	0.514	526
3....	4,940	3.0	6.0	0.0	7.0	41.1	37.8	5.1	0 459	691
4....	5,580	2.0	7.0	0.0	5.0	42.1	40.1	3.8	0.434	732
5....	5,228	1.5	7.0	0.0	5.5	41.1	40.9	4.0	0.438	739
6....	4,872	1.7	7.6	0.0	4.7	41.1	40.9	4.0	0.439	748
7....	4,617	1.7	9.1	0.0	4.2	38.7	42.5	3.8	0.453	785
8....	4,907	1.7	9 3	0.0	4.0	38 3	43 2	3.5	0.453	795
9....	4,261	2.0	9.0	0.0	5.0	42.9	37.8	3.3	0.437	750
10....	2,023	8.2	3.8	0.0	14.0	51.8	18.5	3.7	0.472	501
11....	781	12.8	1.6	0.0	15.7	57.5	9.3	3.1	0.485	384
Total..	39,609	....	....	....	....	...	....	....	....	....
Av. analysis		3.1	7.1	Tr.	6.2	41.2	37.4	5.0	0.460	706

Run No. 3.—No. 4 Jones Set, Metropolitan, August 2, 1913.

Minutes.	Gross Make.	Purge Gas.	Net Make.	Prim. Oil.	Sec. Oil.	Total Oil.	Prim. Temp. Degs. F.	Sec. Temp. Degs. F.	Neck Temp. Degs. F.
0.	....	....	....	....	....	....	1,620	1,390	1,680
1.....	1,244	600	644	....	....	....	1,590	1,350	1,680
2.....	1,561	700	861	16.8	19.4	36.2	1,570	1,300	1,680
3.....	4,878	700	4,178	14.0	18.7	32.7	1,560	1,190	1,670
4.....	5,463	700	4,763	19 6	18.6	38.2	1,550	1,130	1,670
5.....	5,512	700	4,812	17.7	18.6	36.3	1,530	1,100	1,670
6.....	4,976	700	4,276	14.0	19.6	33.6	1,520	1,080	1,660
7. ...	4,927	700	4,227	14.0	19.6	33.6	1,520	1,050	1,660
8.....	4,951	700	4,251	16.8	21.4	38.2	1,510	1,040	1,650
9.....	5,098	700	4,398	17.7	21.4	39.1	1,500	1,020	1,650
10.....	4,146	....	4,146	....	....	....	1,510	1,020	1,650
11.....	1,927	....	1,927	....	....	....	1,510	1,040	1,640
12.....	878	....	878	....	....	....	1,500	1,080	1,640
	45,561	6,200	39,361	130.6	157.3	287.9	....	....	....

	Gallons.	Gallons per 1,000
Make, oil	287.9	= 7.30
Heat, oil	45.8	= 1.17
Total oil	333.7 gallons.	= 8.47

Net gas made.....39,361 cubic feet.

Analysis Sheet.

Minutes.	CO_2.	CnH_2n.	O_2.	CO.	H_2.	CH_4.	N_2.	Sp. Gr.	B. T.U.
1....	16.0	0.0	0.0	0.0	Gas would not explode.		84.0	1.059	000
2.	20.0	1.0	0.0	12.0	22.7	23.5	20.8	.780	380
3....	6.3	4.0	0.0	10.6	37.3	34.9	6.8	.525	618
4....	4.0	5.0	0.0	7.4	41.8	36.2	5.6	.535	657
5....	1.7	6.4	0.0	4.5	42.8	40.1	3.5	.428	721
6 ...	1.7	7.3	0.0	4.4	40.4	40.4	5.8	.447	733
7....	2.0	7.8	0.0	4.2	39.6	41.6	5.8	.452	752
8 ...	1.8	8.4	0.0	2.8	37.2	43.5	6.3	.464	772
9....	1.6	8.6	0.0	2.8	37.7	43.5	5.8	.459	778
10....	1.6	8.9	0.0	2.2	39.7	42.9	4.7	.443	782
11....	6.0	5.7	0.0	9.7	46.7	26.2	5.7	.474	589
12. ..	10.8	2.6	0.0	13.6	54.3	13.4	5.3	.496	451
Average	3.6	6.6	0.0	5.1	39.3	38.2	7.2	.477	695

Run No. 4.—Aug. 7, 1913.

Min. utes.	Gross Make.	Purge Gas.	Net Make.	Prim. Oil.	Sec. Oil.	Total Oil.	Prim. Temp. Degs. F.	Sec. Temp. Degs. F.	Neck Temp. Degs. F.
0.....	...	....	.	....	....	....	1,670	1,610	1,680
1.....	1,370	700	670	....	....	....	1,640	1,600	1,680
2.....	2,215	800	1,415	....	...	11.2	1,620	1,590	1,680
3. ...	3,906	800	3,100	11.4	13.9	25.3	1,610	1,580	1,670
4. .	4,453	800	3,653	13.5	16.4	29.9	1,600	1,590	1,670
5.....	4,864	800	4,064	15.2	18.4	33.6	1,590	1,590	1,670
6....	5,343	700	4,643	17.2	21.0	38.2	1,550	1,600	1,670
7.....	5,846	800	5,046	19.4	23.5	42.9	1,520	1,600	1,670
8.....	5,206	700	4,506	18.0	21.9	39.9	1,500	1,600	1,670
9.....	5,024	800	4,224	16.9	20.4	37.3	1,500	1,600	1,670
10.....	4,156	800	3,356	13.6	16.6	30.2	1,490	1,600	1,660
11. ..	3,151	800	2,351	....	....	....	1,500	1,560	1,660
12....	1,530	....	1,530	....	....	...	1,510	1,530	1,660
13.....	594	....	594	....	...	....	1,510	1,520	1,650
	47,658	8,500	39,158	130.5	158.0	288.5	....	...	....

	Gals.	Gals. per 1,000.
Make oil	288.5	= 7.37
Heat oil	45.8	= 1.16
Total oil.	334.3	= 8.53

Net gas made..... 39,158 cubic feet.

Analysis Sheet.—Aug. 7, 1913.

Mins.	Net Make.	CO_2.	CnH_2n.	O_2.	CO.	H_2.	CH_4.	N_2.	Sp. Gr.	B.T.U.
1....	670	22.2	0.4	0.6	8.8	9.8	17.0	41.2	.852	87
2....	1,415	7.5	4.1	..	11.4	39.3	32.1	5.6	.525	601
3 ..	3,106	4.5	4.5	..	9.4	43.5	33.3	4.8	.466	629
4 ..	3,653	3.4	5.0	..	7.6	44.8	35.7	3 5	.438	663
5 ...	4,064	2.4	6.6	..	6.0	45.3	36.8	2.9	.422	704
6 ..	4,643	1.8	7.8	..	4.6	42.0	40.0	3.8	.436	747
7 ..	5,046	1.6	8.6	..	3.8	41.6	41.6	2.8	.422	774
8 ..	4,506	1.7	9.4	..	3.7	38.3	43.3	3.6	.455	797
9 ..	4,224	1.9	9.7	..	4.0	35.2	45.0	4.2	.477	812
10 ...	3,356	2.0	9.2	..	4.6	37.9	42.1	4.2	.465	781
11 ..	2,351	3.0	7.5	..	7.5	39.2	36.9	5.9	.480	707
12....	1,530	5.2	6.0	..	9.4	45.0	29.1	5.3	.473	619
13 ...	594	12.4	1.6	..	14.3	57.8	9.0	4.9	.481	377
Total.	39,158	....	....	...	....	....	....	....	....	...
Av. analysis		3.1	7.7	Tr.	6.0	40.8	38.0	4.5	.462	721

Average Analysis of 10, 11, 12, 13 and 14-Minute Runs.—No. 4 Metropolitan Set, August 2 to 7, 1913.—Velocity Test.

Run.	Net Make.	Total Oil, per M.	CO_2.	CnH_2n.	O_2.	CO.	H_2.	CH_4.	N_2.	B.T.U.
10-minute	36,715	8.6	3.0	6.1	0.0	7.3	43.7	35.6	4.3	679
11 "	39,609	8.5	3.1	7.1	Tr.	6.2	41.2	37.4	5.0	706
12 "	39,361	8.47	3.6	6.6	0.0	5.1	39.3	38.2	7.2	695
13 "	39,158	8.53	3.1	7.6	Tr.	6.0	40.8	38.0	4.5	721
14 "	40,204	8.6	3.2	6.6	0.0	6.1	42.2	37.5	4.4	700

(*Continued on page 282.*)

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NEW YORK, MONDAY, NOVEMBER 3, 1913.

BRIEFLY TOLD.

Good Publicity Work.—Mr. Robert E. Livingstone, the Editor of *Gas Logic* (the handsome magazine that is effectively published to advertise among the residents the gas interests of New York and Bronx boroughs), is to be congratulated over the success which attended his efforts in respect to stimulating local interest in the recent convention of the American Gas Institute at Richmond, Va. Heretofore no especial effort has been made to arouse local public interest in the current doings of a gas association meeting; in fact, the State Associations have been far advanced in this respect. But, come to think of it, the last statement is rather in error, for the Pacific Coast Gas Association, largely through the forsight and push of such men as the late Mr. Barrett, and the very much alive Messrs. Britton and Jones, has had the fullest measure of local publicity given to its assemblings. However, it is our pleasing task to this year give full mead of credit on this account to the Messrs. Addicks-Livingstone-Ramsdell combination. Of course, the central one of the named trinity was the activo man in disseminating the news that the gas men were proposing to come to, did arrive, and were to depart from Richmond on certain named dates. All the newspapers devoted columns—yes, pages—to these matters, and the typed-text was plentifully interspersed with pictures of the men who made their mark in the gas industry. The Richmond press in general (and a wide-awake, up-to-date collection they assuredly are) responded nobly, and it is not individualizing the good work when it is remarked that that splendid, old-time exemplar of the American Press (the Richmond *Times-Dispatch*) was foremost in the good work. As an instance, its issue for the Sunday preceding the opening session contained an article that occupied virtually two of its most prominent pages, the text being illustrated, for instance, with reproductions of the exterior of the first house in New York city in which gas was used as the sole illuminant, etc. Take it all-in all, the professors of publicity, captained by "Bob." Livingstone, did their work so well that their example in the future, as to influencing the latter, will often be quoted.

An Appreciation of the Courtesy of the Women of Richmond.—The splendid hospitality and entertainment extended to and provided for the ladies attending the past meeting in Richmond of the American Gas Institute were so unusual, and included so much personal attention by the prominent ladies of that city, that the visitors felt some special recognition was not only necessary but imperative. Accordingly a committee was selected and charged with the duty of making some proper acknowledgment of the most agreeable attentions enjoyed. The result of the deliberations of the Committee is shown in the following note:

To the Ladies Composing the Reception Committee, Richmond, Va.:

Resolved, The ladies accompanying the members of the American Gas Institute during its convention carry away the most pleasant impressions of Richmond. The historic past of the city commands reverent attention, but the living present was most gracefully illustrated by the many courtesies and attentions of the ladies of Richmond, and in recognition of this,

Resolved, That the visiting ladies convey to their charming entertainers their sincere thanks, and express their deep appreciation of the unbounded hospitality shown.

Mrs. Walter R. Addicks,
Mrs. Wm. H. Gartley.
Mrs. Alan Dean Whittaker, Chair.

Autumn Meeting, New Jersey State Gas Association.—Through the courtesy of Mr. O. F. Potter, Secretary, we are informed that the New Jersey State Gas Association will hold its autmnal meeting in the Assembly Room of the Public Service Gas Company, 84 Sip avenue, Jersey City, on Wednesday, Nov. 12th, 1913, convening at 2 o'clock P.M. The main theme of the meeting will be "New Business," from the various standpoints that gas men view it. A gentleman of prominence in national advertising will talk on that subject, and Mr. Ralph H. Garrison, General Superintendent, Atlantic Highlands Gas Company, will discuss "Street Lighting" as a field for the new business men in the gas fraternity. Mr. Henry Cohen (Atlantic City Gas Company) will read his paper on "Salesmanship." Mr. James P. Hanlan (Public Service Gas Company) will read a paper on "New Business," who will undoubtedly treat his subject in the same broad way that has characterized his views in the past. As Mr. Hanlan has achieved phenomenal success in his chosen field, anything he may have to say will be well worth listening to and remembering. The Hon. P. Frank Buck, of Millville, will talk on "New Business" from the Solicitors' standpoint, and his view will also be well worth knowing. The papers named will be of the 10-minute order, following which there will be sufficient time to give all of the members opportunity to discuss the different subjects. The Public Service Assembly Room is accessible from all points, as it is in this building that the Hudson and Manhattan Railroad has one of its Jersey City tube stations, which connects with the Pennsylvania Railroad, Manhattan Transfer, making it easily reached by all members of the Association.

Annual Meeting, New England Section, National Commercial Gas Association.—About 125 members of the New England Section of the National Commercial Gas Association were present at the annual meeting (which included an election for officers), that took place in Wesleyan Hall, 36 Bromfield street, Boston, the evening of October 24th. Previous to the meeting, a buffet lunch was served, from 6:30 until 7:30. The retiring president, Mr. C. G. Goeltz, on account of other pressing business, was unable to be present. In his stead Mr. A. H. Vegkley, having called the meeting to order, introduced the guest of the evening, Mr. E. N. Wrightington, Vice-President of the Boston Consolidated Gas Company and past-President of the National Commercial Gas Association, who gave a short address of "Welcome and Encouragement." He dwelt on the growth of the membership, and urged the necessity of taking an active interest in the work of the Section. He also spoke of the value of the course of lectures given by the N. C. G. A., advising strongly that every member join a class. Following Mr. Wrightington's remarks, the named officers were elected and installed:

President—A. C. Witte, Fall River, Mass.
Vice-President—C. H. Stevens, Lynn, Mass.
Secretary and Treasurer—C. J. Connell, Boston.
Directors—H. K. Morrison, Brockton, Mass.; A. F. Pettingell, Cambridge, Mass.; L. G. Swan, Lawrence, Mass.; C. E. Page, Malden, Mass.; J. A. Langelier, Nashau, N. H.; B. J. Bean, Natick, Mass.; R. A. Fancy, Newton, Mass.; G. P. Smith, Jr., Weymouth, Mass.; F. K. Wells, Boston: W. B. Nichols, Quincy, Mass.; G. E. Harris, Boston; J. L. Tudbury, Salem, Mass.; E. V. Ripley, Auburndale, Mass.; Thomas Thomas, Boston; A. H. Vegkley, Boston, N. W. Gifford, E. Boston, Mass.

Having assumed the Chair, Mr. Witte addressed the members, soliciting their earnest, loyal co-operation, in order that the efforts of these officers might be brought to a successful termination. A

very enjoyable entertainment followed, the programme of which wa as follows:

Mr. and Mrs. Clarence G. Bartlett, refined, versatile, entertainers; Harry Isaac, songs; Charlie Williams, songs; Arthur Atkinson, piano solo. Orchestra furnished music, playing many of the popular airs, which were voiced aloud by the entire gathering.—C. J. CONNELL, Secretary.

OCTOBER MEETING, PHILADELPHIA SECTION, ILLUMINATING ENGINEERING SOCIETY.—This session was held the evening of the 17th ult., in the Engineers' Club, Philadelphia, Prof. George A. Hoadley in the Chair. Prior to the meeting 60 members and their guests dined in the Club's restaurant. The regular proceedings were notable for a splendid report (submitted by Mr. William J. Serrill) concerning the annual general meeting of the Society in Pittsburgh. The set paper for the evening was one descriptive of "A Simple Unit-Method for Measuring the Intrinsic Actinicity of Flames and Surfaces for the Practice of Photography," which was prepared by Mr. F. M. Steadman—it was read by Prof. A. W. Goodspeed. Kindred thereto, Mr. Calvert gave a very clever description of a bank of lamps used by photographers in taking pictures under artificial lights. A bank of the type noted was shown. Mr. Hulse furnished an interesting display of photographic lenses, and his word portrayal in consonance therewith contributed greatly to the interest that the display aroused.

CURRENT MENTION.—

AT the annual meeting of the Douglas (Ariz.) Gas Corporation these officers were re-elected: Directors, E. Titcomb, W. N. Hamaker (Los Angeles, Cal.), H. M. Clagett, C. O. Ellis and F. E. Murphy; President, E. Titcomb; Vice-President, C. O. Ellis; Treasurer and Secretary, F. E. Murphy.

THE Kennedy Gas Saving Stove and Range Corporation, to "Manufacture and sell gas stoves and gas saving devices," has been incorporated (Camden, N. J.) by Messrs. Jas. E. Kennedy, John T. Aker, W. R. Kennedy, T. H. Rowland and G. A. Kennedy. It is capitalized in $500,000.

ACCORDING to the annual report of Mr. A. J. Jacobs, Supervisor of Public Lighting, St. Louis, Mo., the public lighting of that city for the current twelvemonth (including the cost of lighting the public buildings) amounted to $707,790. Of the total street mileage (936.43) that lighted by public lamps figures 835.61. The alley mileage amounts to 380.86, of which mileage one-ninth is lighted. The average candle power of the gas supplied figured 12.7 per cent. in excess of the standard. Gas meters to the number of 236 were tested on complaint of consumers, and these checked-up as follows: Correct, 105; fast, 56; slow, 75; average over all, 2.42 per cent. fast. Nine persons and 3 animals were killed by contact with live wires. An interesting paragraph in the report is this: "A trial was made of lighting Union Market with quartz, mercury lamps, but the greenish color characteristic of the light was found unsuitable on account of the spoiled appearance imparted to meats and certain vegetables."

THE Columbia Gas Construction Company is constructing the new plant for the Oconomowoc (Wis.) Gas Company. Provision has been made for a storage holder up to retaining 50,000 cubic feet.

"L. V. T." is informed that Mayor Jost, of Kansas City, temporarily appointed Mr. Joseph Crawford as City Gas Inspector, vice Mr. Robert Goodnow, who was promoted to the position of Collector of Water Rates. Later on examination under civil service rules will be had to secure a permanent occupant.

THE Catonsville (Md.) Gas Company is extending its mains to and through the outlying settlement (apart about 4 miles) of Ellicott City.

THE Massachusetts Board of Gas and Electric Light Commissioners has approved a new issue of capital stock by the Easthampton Gas and Electric Company, amounting to $100,000. This brings the total emitted to $450,000. The Company has engaged Mr. T. H. Day to speak, in the Payson parish house next Monday, on the subject of "How to Properly Illuminate the Office, Shop and Home."

THE New Castle Light Company was chartered in Dover, Del., last month, to take over for operation the gas and electric utilities of the named place.

LAST month, before a jury in the County Court, Albany, N. Y., it was determined that Mrs. Mary Fay, of 217 North Pearl street, Albany, had no cause for action against the Municipal Gas Company. Alleging that a leak existed in a service pipe, and that the gas escaping therefrom had caused her severe physical suffering, she prayed for $2,000 damages. On the trial it was shown that she had not notified the Company of the existing conditions for some time after her noticing them; and it was further shown the Company made the rectification immediately on being apprised of the trouble.

THE residents of Interlaken, N. J., having guaranteed the Consolidated Gas Company, of New Jersey, that a certain number of the residents will use a stipulated volume of gas each month, the service will be laid on as soon as practicable.

ON Wednesday week Messrs. H. V. Massey, W. E. Hughes and Horace S. Wendell will apply to the Governor of Pennsylvania for a charter under which to operate the Schuylkill County Gas Company. The avowed purpose of the applicants is to purchase or manufacture gas for supplying the same on fuel account or use to the inhabitants of the named county. L. L. Frank is the legal representative.

LAST month the Chemistry Classes of the Lewis and Clark High School, Spokane, Wash., visited the works of the local Gas Company, under the leadership of Prof. G. F. Clukey. Superintendent Stack conducted the visitors through the plant, explaining in detail the system of gas manufacture and the functions of the different series and pieces of apparatus that were under view.

MR. WILLIAM C. MCCLURE has been elected Vice-President of the St. Petersburg (Fla.) Investment Company, succeeding Mr. A. P. Avery. Mr. McClure may be remembered as the party who was the successful bidder for the gas franchise passed by a former Council, which fronchise eventually lapsed by limitation, through the failure the McClure people to finance it.

SOME days age the proprietors of the Council Bluffs (Ia.) Citizens Gas and Electric Company paid into the city treasury $6,833.82, representing the royalty accruing on gross earnings for the year ended September 30, 1913. The prior year the sum on like account was $5,519.18. We submit that a 20 per cent. increase in the instance under mention is pretty good evidence that "decay" is not strongly shown in the gas industry. In fact, it sounds more like "cadence" than "decadence!"

"E. C.," writing from Yarmouth, Nova Scotia, under date of the 27th ult., says: "Looking through the recent issues of the JOURNAL, I did not see any mention of the recent death of Mr. H. B. Cann, to whose persistence and assistance this far-away city has had a gas supply. Accordingly, I forward this in the belief you will deem it suitable for printing. Deceased, who was in his 58th year, had been a resident of Yarmouth over 40 years, was always prominent in its business matters, and his connections with the United States (mainly through shipping interests) frequently brought him to Boston. In fact, it was while in a Boston hospital, where he was being treated for a nervous disorder, that he passed away, the evening of September 22d. For many years he was President and Managing Director of the Hugh Cann & Sons (Limited) line of steamships, President of the New Burrill-Johnson Iron Company, as well as other prominent enterprises of his home city. Nor did his activities cease with business affairs, for his relations to public matters (civic and religious) were many. His generosity was typical of a wholesouled nature; in fact, in his benefactions he knew neither race nor creed. His widow (who was a daughter of that distinguished Canadian, the late Senator John Lovitt), five sons, three daughters, three sisters and a brother survive him."

Last month a meeting of the employees of the Twin State Gas and Electric Company, Dover, N. H., was held, the outcome of which was the formation of a Local Chapter of the National Bureau of Safety. Mr. Fred. H. Robinson was elected President and Mr. M. F. Coyne was chosen Secretary. Mr. Shane, Secretary of the National Bureau (which is avowedly an organization to further the interest of workmen in respect of the safeguarding of its members during the pursuit of their daily avocations), attended the meeting and clearly outlined the purposes of the general body. At a meeting to be held some time this month the further organization of the Chapter will be advanced.

THUS far 78 concerns have registered their applications for space in the arranging for exhibition of gas appliances that is to be so attractive and important a feature in connection with the Philadelphia December meeting, National Commercial Gas Association.

THE DeKalb Civic Service Company has applied to the authorities of Decatur, Ga., for a franchise to manufacture and distribute gas to the residents thereof. The application will be considered at the meeting of the City Council proposed for the 7th inst.

"B. B. M." is informed that the Clay Center (Kas.) City Council, on the 11th ult., granted to George McCormick and associates, of Manhattan, Kas., the right to build and operate a gas plant in the first named place. The maximum (net) rate that may be charged is $1.40; the minimum, $1.25, in accordance with a graded use per month.

AT the recent special meeting of the Brooklyn (N. Y.) Borough Gas Company the shareholders indorsed the proposition of the Directors to increase the authorized capital of $500,000 to $1,000,000.

"HERE is another sample of the grasping nature of a tentacled corporation. Responding to the request of the Young Men's Christian Association, of Marion, Ind., for furniture and other equipment to cause their new headquarters to become habitable, the Jounson Furniture Company volunteered to furnish the reception and lounging room on the second floor, and Mr. Clifford (on behalf of the Central Indiana Lighting Company) offered to fully equip the cooking school room with a gas range, hot plates, warming tables and the like, without any charge therefor.—H. H. L."

MR. C. C. DAVIDSON, of Cedar Rapids, Ia., has been appointed Commercial Manager of the Charles City (Ia.) Gas Company.

(Continued from page 279.)

Run No. 5.—August 7, 1913.

Minutes.	Gross Make.	Purge Gas.	Net Make.	Prim. Oil.	Sec. Oil.	Total Oil.	Prim. Temp. Degs. F.	Sec. Temp. Degs. F.	Neck Temp. Degs. F.
0....	....	....	....	...	....	....	1,700	1,620	1,690
1....	1,233	700	533	...	....	....	1,660	1,600	1,690
2....	1,416	700	716	2.7	3.3	6.0	1,640	1,590	1,690
3....	4,658	600	4,058	14.3	17.4	31.7	1,620	1,570	1,680
4....	3,707	700	3,007	11.0	13 3	24.3	1,610	1,560	1,686
5....	4,098	700	3,398	12.6	15.4	28.0	1,600	1,560	1,680
6....	5,171	700	4,471	16.8	20.5	37.3	1,560	1,570	1,680
7....	5,098	700	4,398	15.2	18.4	33.6	1,550	1,560	1,670
8....	4,146	600	3,536	11.3	13.8	25.1	1,560	1.560	1,670
9....	3,610	700	2,910	9.7	11.7	21 4	1,550	1,550	1,670
10....	3,658	700	2,958	11.8	14.3	26.1	1,550	1,550	1,670
11....	4,414	700	3,714	15.1	18.4	33.5	1,520	1,550	1,670
12....	4,524	700	3,824	9.9	12.1	22.0	1,510	1,560	1,660
13....	1,901	....	1,901	....	....	....	1,520	1,480	1,650
14....	780	....	780	....	....	....	1,520	1,480	1,650
	48,404	8,200	40,204	130.5	158.5	289.0	....	...	....

	Gallons.	Gallons per 1,000.
Make, oil	289.0	= 7.2
Heat, oil	45.8	= 1.13
Total oil	334.8	= 8.33

Net gas made..... 40,204 cubic feet.

Analysis Sheet.—August 7, 1913.

Mins.	Net Make.	CO_2.	C_nH_{2n}.	C_2.	CO.	H_2.	CH_4.	N_2.	Sp.Gr.	B.T.U.
1....	533	22.0	...	...	7.6	9.8	15.3	45.3	.940	224
2....	716	18.8	1.0	...	11.2	26.5	22.4	20.1	.743	389
3....	4,058	4.0	4 8	...	8.6	40.4	37.2	5.0	.473	663
4....	3,007	3.2	5.8	...	7.0	44.3	36.4	3.3	.437	683
5....	3,398	3.0	6.2	...	6.4	44.1	36.6	3.7	.438	691
6....	4,471	1.6	6.4	...	4.4	43.3	40.9	3.4	.421	731
7....	4,398	1.6	7.6	..	4.2	41.4	41.9	3.3	.431	759
8....	3,536	2.0	8.8	...	4.6	41.4	40.2	3.0	.442	767
9....	2,910	2.6	6.7	...	6.1	44.2	37.4	3.0	.431	708
10....	2.958	2.2	7.3	...	5.1	40.8	40.6	4.0	.447	740
11....	3,714	1.8	8.0	...	4.2	39.6	42.3	4.1	.447	764
12....	3,824	1.8	8 2	...	3.6	39.4	42.5	4.5	.448	768
13....	1,901	6.9	4 3	...	15.0	57.4	15.4	1.0	.427	499
14....	780	8 8	3.5	...	15.3	59.9	12.1	0.4	.429	458
Total...	40,204	...	...	...	....	....	....	...	...	...
Av. analysis....		3.2	6.6	...	6.1	42.2	37.5	4.4	.452	700

Drop in purge gas in 3d minute affected 4th minute's gas.
" " " 8th " " 9th " "

Experiments in the Illumination of a Sunday School Room with Gas.

[From a paper read by MR. EDWIN F. KINGSBURY, at Pittsburgh Meeting, Illuminating Engineering Society.]

The planning of the lighting of a church auditorium is usually carefully studied from every angle, to secure ample, uniform illumination, and to bring out the best artistic effect; but when the Sunday school room is reached ideas of economy creep in, and almost any style of illumination is made to do, though this room may be used more frequently and for more varied purposes than the auditorium. While, from the nature of the 2 rooms, it may not be desirable to aim for the same effect in the Sunday school room as in the church proper, still the lighting of the former should include the best principles of good, practical installations. My purpose is to describe some experiments in the illumination of the Sunday school room of the Summit Presbyterian Church, Germantown, Philadelphia. The room is typical of many used for Sunday school purposes, comprising a large, open, central portion, with alcoves on two sides which can be closed and utilized for classes.

The lighting requirements demand that the sides be treated as distinctive rooms, and that two plans be adopted. The usual solution is one or more chandeliers over the main floor, and a smaller one in each alcove. In the present case a stained glass ceiling over the center could be used advantageously, and in each alcove were two wall outlets. Several reasons for placing the light sources above the ceiling in the central portion existed. The light was removed from the field of vision, and utilized the beauty of the stained glass, which any lamps hanging below would tend to obscure. Then, also, the attic was easy of access for maintenance. Lighting the sides was more difficult as utilizing the present outlets brought the lights too low, for the audience sits where the light from one row of lamps would be square in the eyes. Even well-frosted globes were objectionable, as the walls were dark and the contrast marked.

The room (Fig. 1) is 60 feet long by 35 feet wide and 35 feet high.

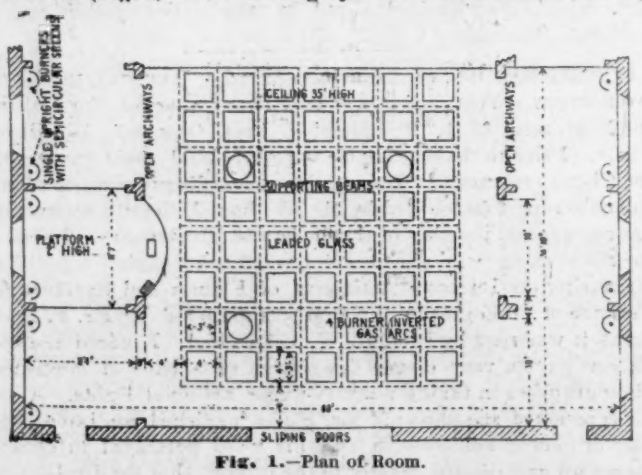


Fig. 1.—Plan of Room.

Twelve feet from the front and back walls open archways rise, the walls in front at the top curving inwardly to meet a glass paneled ceiling, 28 feet long by 42 feet wide, each panel 3 feet by 3 feet. Heavy blinds slide between the arch posts at the rear to make 3 separate rooms. The wall north of the main floor, composed of 3 heavy Venetian blinds, which can be raised to include the low ceiling room beyond it as a part of the school room, rises to only one-third of the full height of the room, the space above being entirely open. These 3 blinds, however, were closed throughout the test. At the south are large, double, sliding-doors in the center, the body of the wall being plain and curving inwardly at the top to meet the ceiling, as in the front and rear. Wooden wainscoting 5 feet high extends around the room, the north side excepted. All wood work is dark oak, the walls dark green. The room is lighted in the daytime by 3 large stained glass windows at the rear, those in front being of no use, because covered by a later built portion of the church.

The body of the room was originally lighted by 12 small inverted incandescent gas burners at each end, distributed uniformly along horizontal beams, 15 feet high, at the base of the arches, and supplied with pilots and pendant chains for lighting.

The illumination of the alcoves was by 3 small inverted units and some open flame burners. This installation was unsatisfactory, for at least two reasons. First, the reaching up with a hook to catch 24 rings was monotonous and time-consuming, especially if the room were rather dark, or if the rings were set to swinging before being caught. Secondly, the glare from the row at one end in the eyes of a person sitting at the other end was annoying. These two rows of lights were, therefore, removed and the glass ceiling utilized by placing a 4-burner, inverted, incandescent gas arc above the 4 panels indicated by the circles. The magnet valve pilot system of ignition is used, two push buttons on the main floor near the southeast door, each lighting a pair of lamps. Each lamp is equipped with a polished aluminum, conical, focusing reflector 11 inches diameter at the top, 26 inches at the bottom and 16 inches high. The mantles are 30 inches from the ceiling and the bottom of the reflector 16 inches. Opal globes were decided upon, as clear globes gave a very bright spot in the center with bright, concentric rings. The spots were not visible except when looking up at the lights, but the illumination on the floor below any lamp was nearly double that half-way between. Opal globes obviated this, as shown in Figs. 4 and 5, and this system has been in use 1½ years and has given satisfaction.

The desultory lighting in the rear of the arches was untouched until recently, when we placed upright incandescent burners on the 6 outlets in the front and on 5 of the 6 in the rear. Ten inches in front of each lamp was a semicircular, translucent, paper screen, highly glazed on the inner side and matt on the outer. A plain, creamy-white bathroom wall paper answered temporarily, the object being to reflect part of the light to the wall. The light reflected from the wall, with that fraction transmitted through the screen, forms a light source of large area and low intrinsic brilliancy. The position of the curve is imitative of daylight window illumination, and should partake of its naturalness. If the wall is ornamented the screens may be, but in the present case both were plain. The screen, 10

inches high with a radius of 10 inches (and having the light at the center), shields the source from practically every position, except when one sits sideways and almost directly beneath a lamp the bare mantle can be seen by looking upward. This can be remedied by making the screen a little wider or lowering it somewhat.

In order to prevent too much light being thrown back against the wall, and to direct more obliquely to the floor, as sunlight would be, a small rectangular piece of bright tin was placed (experimentally) directly in the rear of each mantle, slanting forward a trifle. By selecting the proper width and angle for this reflector any desired effect can be obtained.

Owing to the high absorption of the wall and woodwork, a more efficient diffusive surface back of each unit was imperative, and a semi-matt, white paper, 36 inches by 36 inches, was pasted on the wall. Fig. 2 shows the front of the room and Fig. 3 the rear under this

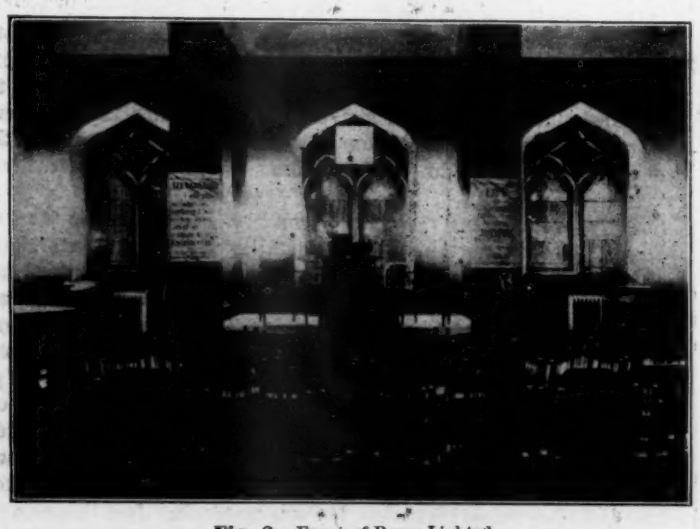


Fig. 2.—Front of Room Lighted.

Fig. 3.—Rear of Room Lighted.

illumination. In the former the light reflected from the floor appears as a bright band running parallel with the wall. At the top of the picture, above the horizontal beam, considerable light is thrown obliquely upwards, and the design painted on the underside of the arches is brought out conspicuously. Unfortunately the wall near the ceiling could not be changed; but if it were white or a light cream, it would help out where most needed—the transition from the side to the main overhead illumination.

The uniformity of the screens and background is shown in both pictures where they cannot be distinguished, except at an oblique angle, as in Fig. 3. This system seems to solve successfully the illumination of the alcoves.

Fig. 6 is a candle power distribution curve of one of the wall units, taken through the plane bisecting the central angle of 180° subtended by the screen. Each arm of the curve has its own particular function. The two back loops go to the wall to be reflected, one to the floor, the other at an oblique angle toward the ceiling, while a considerable part of both will be diffused into the space in front of the unit. The upper front one goes to the ceiling and the lower front one to the floor. It is desirable to have the curve directly in rear of the screen swing in more, as the light thrown straight back is more or less useless. This can be accomplished by making the tin reflector larger, or by having the semi-circular screen, not as a section of a cylinder, but as a section of an hour-glass. Even then any diffused light would keep the wall quite bright. Illumination measurements were taken with all the room fully lighted, with the center lamps and the lamps at one end lighted separately, to show the effect of the two distinct systems on each other. All readings were taken in a 30-inch plane, except the readings on the platform, which were made on a plane 2 feet higher than those on the floor.

Fig. 4 shows the first case with all the lamps at maximum bril-

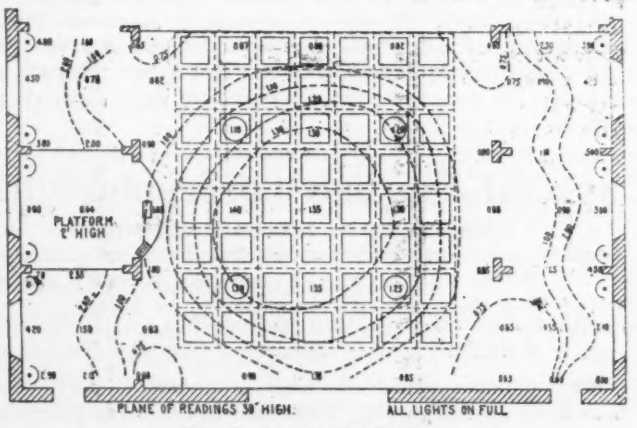


Fig. 4.—Illumination Readings.

liancy. This seems to give the best effect, and, with the lights properly spread, no fatigue or annoyance should be experienced by an audience facing them. However, the alcove lighting is very elastic, and if the maximum light desired at one time is considered excessive at another, the lamps can be turned down, as they are upright burners and will work at any intensity. An analysis of the results shows a high candle power close to the lamps, with a rapid falling off to a minimum directly beneath the arches. Then comes a gradual rise to maximum on the main floor. Fig. 5 shows the center and one end

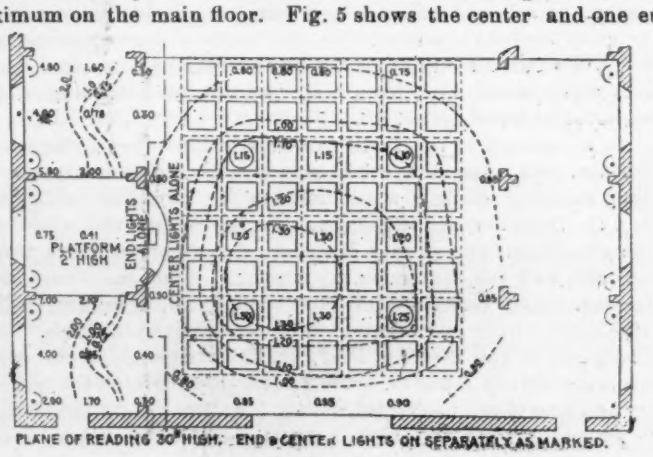


Fig. 5.—Illumination Readings.

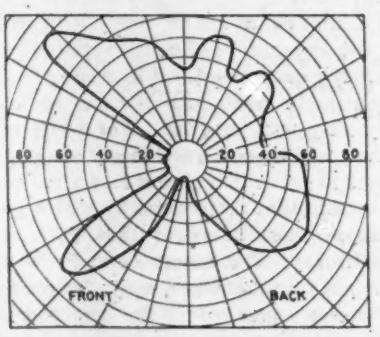


Fig. 6.—Candle Power Distribution Through Vertical Plane of an Alcove Unit.

lighted, the end wall illumination having an appreciable effect on the main floor, enlarging the contours. It would be more desirable if the ends sent additional light beneath the arches, and this could be done by making the wall lighter. The average of foot-candles on the 30-inch plane in the center is 1.08. While this may seem low, it has proven ample and there seems a peculiar advantage in reading responses or singing where the book is held fairly horizontal. The

vertically directed light here from a height gives the feeling experienced in cathedrals, and is, therefore, appropriate. The room is sufficiently well lighted by the 4 arc lamps, but they have little influence back of the arches. There are spots under the archways where the illumination is a trifle too low to allow of continued reading, but these would be corrected by lighter side walls.

This installation is described to show that, in rooms so cut up and apparently hard to illuminate, the very peculiarities may be used to provide something at once unusual and practical. The illuminating engineer should not feel that any situation is so unimportant that anything is good enough. He should be alive to every opportunity to make uncommon out of the common, which means that, while there are certain fundamental rules always to be observed, they are only a beginning, and the remainder of his task depends on his originality. It means that thought and study must be given to each individual case.

Special English Correspondence.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, October 17, 1913.

An Unjust Aspersion on the Gas Industry.—An Installation of Glover-West Retorts at Bridgewater.—Gas and Ideal Homes.

There are two kinds of ignorance in the world—the fool's ignorance and the philosopher's. If the man in the street denounces gas as a swindle he is laughed at, but not believed, and no one is injured more than would happen through the braying of an ass; but if a philosopher expresses an equally ignorant and unfounded opinion the mischief is not so easily ended, for there is a widespread impression to the effect that a man who has risen to a leading position as a chemist, engineer or scientist is necessarily qualified to discourse with authority upon matters outside the sphere of his labors. The views of the man in the street are not quoted as authoritative; but the same opinion, set forth by a known leader, will be accepted as gospel by a large section of the community and freely quoted and adopted without question. So, while the ordinary individual can freely discourse about anything and everything, the same cannot be said about those who, from their position and standing, might be expected to know better.

At a meeting of the British Association for the Advancement of Science, held some few weeks ago, Section B (Chemistry) devoted a long morning sitting to a discussion of the proper utilization of coal and the fuels derived therefrom. As regards the utilization of coal, the gas industry is an easy first, even the impurities being turned to account, and the appliances, by means of which gas is used as a fuel for various purposes, are far more economical, as regards utilization of energy, than any other method of using solid fuels. But the Chairman of the meeting, Prof. H. E. Armstrong, in the course of his introductory remarks, made violent onslaught on the gas industry and everybody connected with it. As Samson did the Philistines, he smote them hip and thigh, but I will not be so rude as to suggest that it was with a similar weapon.

After stating, probably by way of a sardonic joke, that no statement should go forth that could not be freely supported by evidence, and enlarging on the importance of conservation of fuel, he followed up with such extraordinary assertions in respect to gas manufacture and supply that anyone in touch with the gas industry over the last 50 years can only gasp with surprise. For some reason or other, this gentleman never had a good word to say about gas engineers, and a gas works seems to get on his nerves like a red rag affects a bull. On this occasion he said that the process by which gas is made is an absolutely barbarous one (how does that fit a modern set of retorts worked by machinery), that no one cares a rap what is got out of the coal when it is put into the retort, apart from a big yield of gas, that the industry is not advanced in the slightest since 1892, that any chemist worth calling a chemist is excluded from the the industry (not very courteous to gentlemen such as Prof. Vivian B. Lewes, Dr. Harold Coleman, Mr. W. J. A. Butterfield, Dr. A. H. Elliot, Dr. Davidson, besides many others who are now no longer with us), that an Act has been passed which prevents the removal of sulphur compounds from gas, and other statements that are grossly distorted and incorrect. His grievance appears to be that the business has been run on commercial rather than on scientific lines, and that engineers have sought to sell cheap and pay dividends, rather than to follow the lead of the chemist. The utter fallacy underlying all this was proved over and over again in the course of the discussion. Dr. F. G. Beilby spoke on improvements in the distillation of coal. Dr. H. Coleman showed that the gas industry has done a great deal towards the economic use of fuel; and Mr. H. James Yates, discussing the recent advances in gas fire manufacture, proved that this important appliance is not so unscientific as it is painted. Mr. W. H. Patterson gave some account of the progress in methods concerning coal as a solid. These gentlemen conclusively showed that large advances have been made, although it is not contended that finality has been attained. Prof. Armstrong forgets that, in 1802, and for 50 years after, the chemist did not know enough about gas to be of any use to the gas engineer, and that his efforts to assist only had the effect of making confusion worse confounded. He seems to think that the correct direction in which to work is a larger yield of liquids and less gas. It is not very obvious how a reduced yield of gas, necessitating the consumption of a larger quantity of coal, is going to assist the conservation of fuel. And the point about tar that appeals to the gas manager is not so much the rare chemicals that can be abstracted from it as the price he can get in the yard or f.o.b. It is scarcely necessary to add that the shareholding directors of gas companies require the services of men who will satisfy the consumers and earn a dividend, rather than one who speculates in doubtful problems about the conservation of fuel.

Shortly after reading the above report, I visited the gas works at Bridgewater on the occasion of the installation of a new retort house and vertical retorts, and there saw a great deal that was not known in 1802, or for that matter in 1882. A handsome building, with dressings of white and blue brick, and white stone string courses, some 70 feet by 40 feet in area, contained 3 beds of Glover-West vertical retorts, 2 fours and 2 capable of producing 600,000 cubic feet of gas in 24 hours, by the aid of only 3 men. The coal passes, by means of a bucket conveyor, into a storage bin at the top of the building, and is fed into the retorts as required, by the simple movement of a lever. The Chairman of the Company simply donned a pair of stoker's mitts, and after remarking that he was gasmaker for this occasion only, delivered several charges of coal while closely surrounded by his visitors. The beds had been under working lids for a month but there was no sign of soot or black anywhere, the passage of the charge to the retort being effected by a sort of shot pouch arrangement that is entirely closed in. Most of the company were wearing holiday clothing, and the result of a visit to the ordinary retort house would be unfortunate. But neither at the charging chamber at the top, nor the discharging chute at the bottom, was there the slightest escape of gas or smoke. Incidentally the substances that are burnt during the charging and discharging of ordinary retorts, in this case go to swell the yield of gas or of byproducts. There is also no steam or dust from the cooling of coke, as the spent charge is made to yield up the greater part of its heat to the air supply for the producer furnace that heats the retorts, and comes out cool enough to handle. It is simply wheeled away to the coke tip without further treatment. We may safely say that not one of the visitors left Bridgewater without the impression that they all had witnessed a most important advance in the manufacture of gas, especially applicable to gas works liable to flood, or in closely populated districts. There is no longer the excuse that soot, smoke and steam are unavoidable. Mr. James H. Cornish, the Engineer to the Bridgewater Gas Works, who designed and supervised the erection of the whole, stated that the quality of the gas was uniform and well under control, and that he was booking an advance of 1,500 cubic feet per ton of coal carbonized, as compared with the old retort house. The new installation is equal to his total requirement, and the horizontal retorts will be entirely displaced, 10 vertical retorts doing the work of about 100 ordinary.

A somewhat unusual feature in connection with this ceremony was a complimentary presentation from the directors of the Bridgewater Gas Company to Mr. John West, head of the firm of West's Gas Improvements Company, who were the contractors for the whole of the work, and carried it out in the solid, substantial style for which this firm is noted. It took the form of a handsome oak easy chair, constructed by a resident of Bridgewater, from some old oak that had been displaced during the restoration of a very ancient church in the city. The gas engineering profession are extremely gratified at this elegant recognition of the unique position occupied by Mr. John West, after a good half century's labor at the improvement of retort house conditions. At one time Mr. West stood almost alone in this respect. Various charging and drawing machines have been tried, only to be rejected as failures under ordinary retort house conditions. But Mr. West persevered, and gradually broke down the various ob-

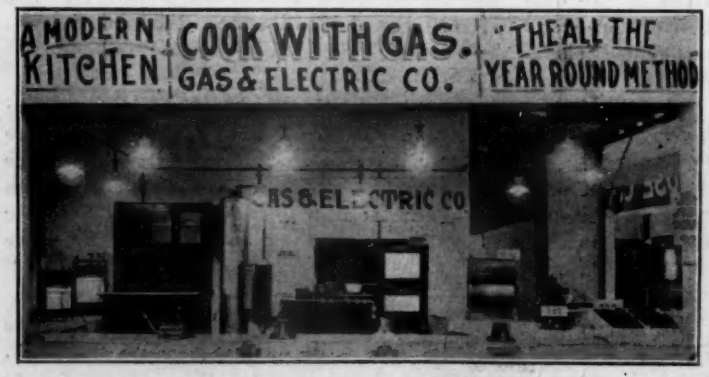
stacles to a successful issue, until at last the West drawing and charging machinery was a recognized success. No doubt the Glover-West vertical system has benefited largely by his long and varied experience. Unfortunately, Mr. John West was unable to be present, which was as much a disappointment to the visitors as to the directors, but was well represented by his son, Mr. Fred. J. West. Another interesting feature was the presence of Mr. Cornish Sen, hale and hearty after the extraordinary record of 64 years in the service of the Bridgewater Gas Company. For more than half a century he was Manager and Secretary, and on retiring some years ago in favor of his son, was at once elected to a seat at the Directors' Board, which he still retains.

There is another exhibition running in London. Under the title of "Ideal Homes," it seeks to illustrate the latest ideas in the way of furniture, house decoration and domestic convenience, and it is held at Earls' Court, only a few minutes' walk from the National Gas Exhibition. The South Metropolitan Gas Company, as they did at a similar exhibition last year, have decided that the claims of gas and coke in this connection shall not go unnoticed, and have arranged a completely furnished set of rooms illustrative of a complete town house, from basement to attic, filled with examples of the latest lighting, cooking and warming appliances, many of which are their own specialties. As the "Ideal Homes" is to some extent controlled by electrical interests, the Company are to be commended for their courage in venturing into the enemies' camp and upholding the credit and position of the gas industry by most convincingly showing that it is in no sense a back number.

New Methods and Appliances.

A Naphthaline and Tar Solvent.—The Tennessee Mining and Manufacturing Company, of Nashville, is making "Little-ene" the trademark for a solvent to remove obstructions from pipe lines and apparatus. This material placed in a washer or scrubber, picks up automatically the naphthaline in the gas and carries it forward to the burner. The combined vapor, when in the washer and on passing along with the balance of the gas, is picked up and made into a permanent gas by the natural heat of the main portion thereof. The gas, passing through the washing liquor, picks up exactly the amount of "Little-ene" necessary to keep the naphthaline permanently suspended, the operation being entirely automatic. In addition, "Little-ene" acts as a solvent for solid naphthaline or thick tar, and it acts immediately when applied directly to a main or service choked with naphthaline. The trouble, delay and expense of opening up and cleaning a clogged rotary washer or a tower scrubber are entirely done away with. "Little-ene" will quickly cure the most stubborn stoppage, and, by absorbing and carrying forward, in gaseous form, the naphthaline which usually deposits on the oxide in the purifiers, back pressure in the boxes is prevented.

The La Crosse (Wis.) Gas and Electric Company Wins First Prize.—At the Tri-State Fair, held in La Crosse, Wis., during the week of September 23d, the La Crosse Gas and Electric Company won the first prize for the best exhibit in the Exposition Building.



La Crosse Gas and Electric Company. "Gas Booth."

The fair was the largest and most successful in the way of attendance ever held in La Crosse, and the Company feels well repaid for the time and expense necessary to put on a "First Prize" exhibit." The Company used two booths, displaying electric appliances in one, and in the other an all-gas-kitchen, the latter is shown in the accompanying illustration. The feature of the exhibit (which made it a big success) was the fact that everything displayed was in use. Bread, cake and pies were baked and given away, as well as boiled eggs, tea and coffee, and other good things to eat and drink. The apparatus exhibited included heating devices, irons and fans, Sturtevant and Eclipse vacuum cleaners, Parian glassware, Welsbach amber glow lamps, Clark-Jewell ranges, Humphrey lamps and water heaters, Detroit-Jewel coke kitchen heaters, Reznor house heaters, W. M. Crane Company's irons, the General Electric heating devices and small appliances, and genuine gas house coke. The Manager of the Company is Mr. Thurston Owens, and the success of the exhibit was due to his joint effort with its Service Agent, Mr. Frank H. Evans, Mr. Philip Linker and "the cook."

A New Type of Concrete Pile.—This, which seems to have the merit of novelty, has been put on the market by the Siegwart Company, of Lucerne, Switzerland. It utilizes the bulged bottom principle common to several patented piles, but is novel in that the enlarged base is made by the use of explosives. The process of making the pile is described as follows: An iron tube, containing a wooden pile with an iron point, and a device at the upper end for deadening the blows of the pile driver, is driven into the ground. The wooden pile is then removed and a cartridge with an electrical detonator is fixed in position at the bottom of the hole. The tube is then filled with wet concrete, a little above the level of the surface of the ground. The iron tube is then drawn up some feet to prevent its end from being shattered, and the cartridge is exploded. After the detonation the concrete sinks down, filling the space hollowed out by the explosion. Finally the tube is filled with concrete, and drawn up gradually as the concrete is put into it. After the completion of this process, and time allowed for the setting of the concrete, there is in position in the ground a pile with a base of greater lateral diameter than it is possible to produce by any other means, and the explosion compressed the adjacent earth. In fact, one pile on this system serves the purpose of several piles of any other type, insuring great economy. By using cartridges of greater or less strength the size of the excavation made by the gas can be controlled; a cartridge 600 or 700 grams in weight makes a spherical hollow of 3 to 4 feet in diameter, according to the quality of the soil.

Publications.

[All Publications, Catalogues, etc., mentioned below, are kept in our office for the convenience of our patrons.]

Some Recent Circulars.—Among recent circulars and the like that are at hand the following seem worthy of note:

A folder from the Atlas Paint Company, of Nashville, Tenn., and New York, which, like most all of the products from the "Atlas Press" is worth while. It is oblong in shape, printed on good paper from clear type, and of a size very convenient for filing or for slipping into a coat pocket. On opening its double fold one is confronted with neatly pasted strips showing on their faces the colors through a wide range (24 shades are given), from light ivory to "Delft Blue" or "Roman Red." The color scheme portrays nicely the color adaptability of the various "A. P. Flatlan Ideal Flat Paints" now being briskly marketed by the Atlas Paint Company.

Another handsomely gotten up, well-arranged quarto pamphlet comes from the "Precision Instrument Company," of Detroit, Mich., the profusely illustrated, clear cut text of which shows and describes the excellent measuring and regulating apparatus manufactured by the named Company. These includs those standard goods, primarily of the Simmance-Abady Company: "Colorgraph," "Gas Calorimetry," and "Gravitometer," also, the well known "Boys' Calorimeter," the instrument used in the official gas testing stations, London, England.

Again, a copy of the beautiful catalogue, issued by the National Tube Company, descriptive of the steaming specialties manufactured in its great plant at Kewanee, Ills. The story of these many useful adjuncts in-and-out of a power plant is well told; and while un-

doubtedly many of these goods are used in gas works, their use would be largely increased if the Company occupied some advertising space in the JOURNAL.

Another welcome visitor is "No. 10, Monthly Bulletin," the National Commercial Gas Association. Of course, its contents this month run largely to matters connected with the annual meeting in Philadelphia next month. There are also five separate articles on as many different subjects, an especially noteworthy one being the continued article, by Mr. W. P. Baylie, Inspector of Accounts, Philadelphia Gas Works, whose theme is "Training the Order and Complaint Clerk." This paper is really a chapter in the preparatory course of the Association's New Business Department.

Still another teacher in illumination and illuminative effect is from the press of the Welsbach Company. Printed on dull ivory finish paper, its measurement, when folded, is a scant 3½ inches by 6¼ inches; when unrolled, the figures are 6¼ inches by 30½ inches. Both sides are taken up with the illustrated descriptions of the Company's many excellent wares and parts thereof. The illustrations number 32, and the stories connected therewith far outnumber the pictures. The accordion style of fold is so complete that each division can be cut out separately, if desired. The title to the folder is "Lights for the Modern Home," and the Company will gladly send on examples per request forwarded either to the shops at Gloucester, N. J., or Philadelphia, Pa.

The final folder (that is, of the present batch) comes from the "Illuminating Engineer, Gas Division, the Gas and Electric Company," Baltimore, Md. We would give his name, were it not for the fact that no mention thereof appears on the folder; whence we imply that individuality must be sunk or merged in the Company's generality. However, Chief Cohn's staff, and the "Chief" himself, are to be congratulated on the close study that resulted in the artistic evolutions now before us. The general scheme is, in fact, a post-card and folder combined, so arranged that, when the reader, having looked at the views, he simply detaches the postal, fills in his complaint, adds his name and address, and the postman does the rest. This folder-postal, however, is mainly burdened with 4 pictures, showing (and these are beautifully done) the interiors of 4 noted Baltimore shops—respectively occupied by a haberdasher, a druggist, a barber and a tobacconist—the lighting of which is not only satisfactorily, but beautifully, done by means of gas. The folder is surely at once attractive and effective.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,074,728. Automatic Gas Lighter. H. Meyer, New York City.

1,074,759. Trapping Device for Gas Burners. G. B. Van Sickel, Garden City, N. Y., assignor to Edward Miller & Co., Meriden, Conn.

1,074,795. Gas Testing Apparatus. E. Johnson, Minneapolis, Minn.

1,074,866. Gas Burner. C. A. Johnson, Jamestown, N. Y.

1,074,913. Gas Cleaner. B. Walter, Pittsburgh, Pa., assignor of one-half to G. H. Smith, Aspinwall, Pa.

1,075,322. Automatic Cut-off for Gas Ranges. C. Bargamin, Newport News, Va., assignor to the Sentinel Automatic Gas Appliance Co., New Haven, Conn.

1,075,354. Gas Regulator. C. W. Henson, Chicago, Ills.

1,075,566. Gas Producer. J. A. Herrick, New York City.

1,075,716. Gas Producer. J. K. Lyons, Pittsburgh, and J. B. Hardie, Crafton, Pa.

1,075,736. Apparatus for Separating Liquid Particles from Gases. A. Spiegel, Grube Messel, Germany, assignor to Gewerkschaft Messel, same place.

Items of Interest
FROM VARIOUS LOCALITIES.

"H. M. F," writing from Revere, Mass., under recent date, informs us that the second meeting for the season of the employees, Suburban Gas and Electric Light Co., was held in the club rooms, the evening of October 21st, Manager Chisholm presiding. After a bountiful supper the "Question Box" was taken up, and several queries therefrom were discussed. Following this, Mr. A. G. Mead read a paper on "The Relation of the Central Station to the Customers," which paper had been read at a recent convention. Its several good points were discussed, and the debate aroused much interest. The meeting was largely attended.

THE Gas Machinery Company, of Cleveland, Ohio, will put in 5 new bench settings in the Racine (Wis.) plant of the Wisconsin Gas and Electric Company. These settings are to consist of through silica retorts and silica settings.

FOLLOWING out the settled policy of keeping its properties in the best possible physical condition, and to provide at all times the improvements and extensions necessary to care for its growing business, the American Public Utilities Company, of the Kelsey, Brewer & Company corporation, is expending $158,000 to improve the properties of the La Crosse (Wis.) Gas and Electric Company, which furnishes gas and electric currents and hot water heat to the residents of the named city. The improvements comprise 400-horse power, new, water tube boilers; 4 automatic stokers with new equipment, 2 steel stacks (for the new boilers) 160 feet high, by 72 inches in diameter; new and larger steam piping for the central station heating plant; new feed water heater and purifier; coal and ash-handling machinery; steam turbine, centrifugal pump and device for heating water by means of exhaust steam and new hot water mains, due to increased demand for heat; increasing the capacity of the heating and electrical department at its Edison station, including new 1,000 kw. capacity prime mover, to take care of the growing load; rearrangement of switchboards, circuit regulators, etc., and enlarging the buildings to house the added boilers and new generating machinery. These betterments will make the La Crosse property one of the finest in the Middle-West.

MR. J. J. DOYLE, formerly District Manager of the Central New York (Newark, N. Y.) Gas and Electric Company, has been appointed Manager, electrical division of the properties of the Hagerstown and Frederick (Md.) Electric Railway Company.

THE newest equipment of the plant of the Quincy (Ills.) Gas, Electric and Heating Company comprises a series of steel and concrete coal and coke bins, the cost thereof being estimated at $20,000.

MR. HENRY A. SHANNON, JR., formerly of Portsmouth, Va., has been appointed Superintendent of the Henderson (N. C.) Gas Improvement Company.

MR. WM. G. FURLONG, Private Secretary to the late Mr. A. N. Brady, has been elected Secretary of the Albany (N. Y.) Gas Company, succeeding Mr. E. Palmer Gavit, the latter having been promoted to the dual position of Vice-President and Treasurer. The other officers are: Chairman Board of Directors, Robert C. Pruyn; President, Nicholas F. Brady.

THE MacArthur Concrete Pile and Foundation Company has been awarded a contract to place 600 or more piles, reinforced concrete slabs and walls, for the foundations to the following structures to be built by the Brooklyn Borough Gas Company, Coney Island section of Greater New York; a gasholder, up to retaining 2,000,000 cubic feet; a tar tank; a salt water condenser and an office building. The general contractor is the Bartlett-Hayward Company, Baltimore, Md.

THE MacArthur Company is also under contract to prepare the foundation for the new stack to be built on the plant of the C. A. Wiley Company, Mott Avenue, Long Island City. The stack contractors are the Messrs. M. W. Kellogg Company.

THE Humphrey Company (Kalamazoo, Mich.) has notified the trade of a change in the prices of the Humphrey automatic geysers, the new

card becoming effective the 22nd ult. Those who have not received the official notification may obtain the same on request. No change, however, has been made in the sales terms on the Company's other staple goods, which include its well-known both geysers and copper coil, tank water-heaters.

THE Insull aggregation of capitalists is said to be seeking ownership of the gas and electrical utilities of Peoria and Galesburg, Ills.; further, it is said that the Insull folks are looking to the acquiring of the properties of the McKinley syndicate.

MR. WILLIAM D. CAUGHEY, for a number of years connected with the Peoples Gas Company, Pittsburgh, Pa., died at his home in the Munhall suburb of Pittsburg, the morning of October 19th. He was in his 60th year, and was a son of the late Miles W. Caughey, who was Secretary and Superintendent of the Erie (Pa.) Gas Company, when the latter corporation was controlled by the late Col. Scott.

MR. GEORGE K. LUTZ is in charge of the work of superintending the construction of the new plant of the Lykens (Pa.) Gas Company.

THE coal gas plant now being erected at San Juan, Porto Rice, by The Gas Machinery Company, will include a sulphate of ammonia apparatus and a drip oil still. Of course, The Gas Machinery Company will furnish these.

"TALK about the mountain that labored to bring into being a mouse! However, what I've to narrate has nothing of the fable about it. Here is the story: The 'City Engineers,' of Kalamazoo, were recently authorized to put in a meter testing apparatus or equipment, by means of which any consumer who felt that he was 'being robbed' by the local gas suppliers could have the proof thereof by official test. The first one to complain was a Mr. Weissmer (one of the 'people') who declared that his gas meter was 'Oh! so fast!' Ever so fast!' The meter was tested in his presence, and the returns sent to him therefrom subsequently showed the meter was fast—2.60 per cent. or 60/100 in excess of that allowed under the ordinance. 'I will make them refund to me,' said he; and his bill for gas used during the month prior to the test was $1.10! I presume he will require that 'the refund' be made in the shape of a certified check.—REBATE."

"V. T. S.," writing from Vancouver, B. C., under recent date, says that the Vancouver Gas Company has been granted an order restraining the authorities from enforcing an ordinance to put the price of gas at 95 cents per 1,000, instead of $1.50. Some weeks ago Council ordered the cut. the same to become effective during the latter half of October; but the Company delared that the City Council was usurping the power of the Public Utilities Commission. The Council retorted that as the Company's franchise was issued prior to the existence of such a Commission the corporation still came under the jurisdiction of the Council.

DR. HOLLIS GODFREY, Chief Inspector of Meters, Bureau of Gas, Philadelphia, has been appointed President of the Drexel Institute, Philadelphia, succeeding Dr. James McAllister, resigned. He takes up his new duties the 1st prox.

THAT great engineering corporation, doing business under the distinctive title of the J. G. White Engineering Corporation, announces that, on the 25th October, the second hydro electric plant of the Tennesee Power Company, on the Ocoee river, Appalachian mountain range, southeastern Tennessee, near Parkville, was put in operation, and it marks an important step in the industrial development of the named section of the South. This plant, together with the other (only 7 miles away), which is also on the same river, will ultimately produce a total of 68,000 horse power. The latter is transmitted to Knoxville, Chattanooga and Nashville, Tenn.; and to Rome (Ga.) as well. The total cost of these undertakings was not far from $5,000,000, and both were constructed by the White Corporation, and the latter unit took 15 months to complete. One of the works is notable for a gigantic concrete breast dam, the other for a huge open flume, 5 miles in length, by means of which the flow is carried along the mountain side. At the end of its journey it passes through steel penstocks, dropping 250 feet to the turbines, which are of the pressure type, each having a capacity of 10,000-horse power. Much of the electrical energy so generated is used in lighting various centers of population along the lines, in moving trolley cars, etc., and the urban population thus directly served numbers at least 250,000.

THE showing made by the American Utilities Company, otherwise Kelsey, Brewer & Co., of Grand Rapids, Mich., for the 12 months ended September 30th last, should certainly please the shareholders—the showing further attests the cleverness of the Company's estimators. The gross in 1911-12, was $1,933,877.63; in 1912-13 the gross was $2,210,345.49. The gain was 276,467.86; their estimate at the outset in the latter respect was $234,905.71. The operating expenses show an increase of 12 per cent. over those of the prior year, but 50 per cent. of this went into physical betterment. The Company's engineering division is certainly up-to-date in every respect.

THE Southern Gas Plants Corporation is the name of the concern, incorporated by Clawson Bachman, Joseph T. Hayden, and A. H. Missley, all of Philadelphia, to "Manufacture, store and distribute gas, erect gas plants," etc.

THE Suburban Gas Company, of East Syracuse, N. Y., will be ready to distribute gas by the 15th inst. As before stated the supply for the present will come from the systems of the Syracuse Lighting Company, it being understood that next spring the Suburban folks will build a plant on the site recently purchased on Manlius street. This is extremely problematical, however, for in the long run the Lighting Company will make a sales' figure well below that at which the Suburban people could succeed in reaching through the agency of a separate plant.

JOHN D. FIELDING, in 1910 Cashier to the Northwestern Gas Light and Coke Company, has been convicted of embezzling $5,000 from that corporation, has been sentenced by Judge Tuthill to an indeterminate sentence of from 1 to 10 years in the Joliet (Ills.) penitentiary.

THE sale of the plant and properties of the Americus (Ga.) Gas and Electric Company (early last month the sale was made) by order of the receiver, has been confirmed. The purchasing bondholders are proposing to reorganize the concern under a new charter. The bid accepted was $150,000.

ARTICLES incorporating the Winters (Cal.) Gas Company have been filed by Messrs. C. A. Erwin, Allen Stark and W. W. Collins.

THE Deily & Fowler Manufacturing Company is rebuilding the plant of the St. Croix Gas Light Company, at Calais, Me., at least in so far as the storage capacity thereof is concerned.

"LAST month, at the regular meeting of the Employees' Association of the Brockton (Mass.) Gas Light Company the members listened to an interesting recital respecting the manufacture of the the Welsbach gas mantles, delivered by Mr. R. E. Thompson, of Boston. At the business session of the Club the preliminaries in the matter of the bowling matches were outlined, as also the advance arrangements for the annual banquet, to be served in a Boston hotel some evening late in current month.—V. M."

MR. ALEXANDER J. MCCLARY, 38 years ago Controller of the Philadelphia Board of City Gas Trustees, and also Purchasing Agent therefor, died at his home in Philadelphia the morning of October 20th. He was in his 71st year. He held other positions connected with the administration of the civic affairs of Philadelphia, and when the local gas properties were leased to the United Gas Improvement Company, Mr. McClary was retained in the City License Bureau. He was at one time a member of the American Gas Light Association, and will be remembered by the old timers particularly from his active connection with the splendid banquet tendered that body, on the occasion of the Philadelphia sessions, October 17, 1879, which banquet was served in the Union League House. Deceased, who was of that disposition which makes friends and retains them, is survived by his wife.

MESSRS. FREESE, BERRINGER AND RAY, representing the owners and builders of the gas plant at Provo, Utah, recently appeared before the City Commission and asked for an extension of time in which to complete the gas works, which were to have been finished on the 1st inst. Having clearly shown that the delays were caused through the failure of delivering of material according to contract, they were given an extension of time, to January 1, 1914.

The Market FOR GAS SECURITIES.

Consolidated gas scored a gain of ¼ point in the bid price as a result of the week's trading, which was of the lightest volume possible. The last month's business done will show a tremendous gain over that recorded for October, 1912, mainly traceable to the dark day record of October, 1913. One financial trader ventured the guess that the output gain, figured in percentage, was not far from 10! Con. gas short term 6's are quoted at 100⅛ to 100⅜.

Brooklyn Union gas is dull (very dull) and steady, the nominal quotations being 122½ to 128, as per noon advices of Friday. Peoples, of Chicago, is to a dot on the figures of a week ago—pretty cheap for an 8 per cent. security, with "a future." The $3,500,000 new stock, to be issued to record shareholders at par, is payable in 4 installments of 25 per cent., payable, respectively, December 15 next, and on February 25, May 25, and August 25, 1914. That seems putting it up easily. The arrangements for disposing of the shares in the Universal and Ogden Companies have been completed, and it is guessed at that the proceeding will cut the Company's surplus in half. However, when "the worst" is ascertained in this respect, the comfortable nest egg can be rounded up at 6½ millions, which should be sufficient to induce shareholders to watch the clutch increase in numbers, if only through interest accumulations.

The output of the Philadelphia division, U. G. I. properties, for the 9 months of current year, compared with that for 1912, shows a gain of 175 millions cubic feet. These shares sold yesterday (Thursday) at 167 in the Philadelphia bourse. Pacific Gas and Electric is weak and dull, the current quotations for it being 33 to 34. The San Francisco Gas and Electric Company has drawn for retirement (on first inst.) $100,000 of the Company's $7,250,000 issue of 30-year 4½'s, at 105 and interest. The Baltimore Consolidated G., E. & P. Company is very much in evidence on the high side of late. Quite a number of transactions in the common (109) and preferred (110) are reported, and the wiseacres are predicting 120 for the former before January first. The earnings for the year (ended Sept. 30) of the American Light and Traction Company are returned at: Gross, 4,396,865; net, $4,274,939; in 1912 the figures were: Gross, $4,190,997; net, $4,072,260. The inquiry for reputable gas bond issues continues quite brisk.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

NOVEMBER 3.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par alue of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$99,816,500	100	129	129¼
Central Union Gas Co.—				
1st 5's, due 1927, J. & J.	3,500,000	1,000	101	103
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	3,600,000	100	157	157
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	99	101
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	59	62
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	96¼	100¼
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	106
Con. 5's, due 1945, J. & J.	1,500,000	—	96	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	105	112
Standard	5,000,000	100	102	104
Preferred	5,000,000	100	93	94
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	91	95
The Brooklyn Union	15,000,000	1,000	122½	128
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	399,650	500	130	—
Out-of-Town Companies.				
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Chicago Gas Co. Guaranteed				
Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric				
Co.	29,500,000	100	69	70
Columbus (O.) Gas Co., 1st				
Mortgage Bonds	1,500,000	1,000	96	98
Columbus Gas Light & Fuel				
Company	1,683,750	100	65¼	66¼
Preferred	3,026,500	100	93	95½
Laclede Gas Co., St. Louis	10,000,000	100	93	95
Preferred	2,500,000	100	—	102½
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	120	130
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	108	
Massachusetts Gas Companies, of Boston	25,000,000	100	91	92
Preferred	25,000,000	100	91	92
Montreal L. H. & P., Canada	9,000,000	100	209	210
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	5,000,000	25	188	190
Peoples Gas Lt. & Coke Co.,				
Chicago	25,000,000	100	124	124½
1st Mortgage	20,100,000	1,000	103	103½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¼	105¼
Pacific Gas and Electric Co.	15,500,000	—	33	34
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	96	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
United Gas Imp. Co.	55,502,950	50	168	169
Washington (D. C.) Gas Co.	1,600,000	300	420	424½
1st Mortgage, 6's	600,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, New York, October 21, 23, 1914. Officers: President, W. H. Gartley, Philadelphia Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting————1914. Officers: President, A. A. Dion, Ottawa; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct., 1914. Officers: President, J. T. Hutchings, Rochester, N. Y.; Secretary, C. H. P. Chapin, 29 W. 39th street, New York City.

Gas Meters.—Monthly Section Meetings; Grand Commissioner, Will. W. Barnes. East Orange, N. J.; Gen'l Sec'y, H. Thurston Owens, La Crosse, Wis.; New York Section, Chairman, W. H. Petties; Secretary, G. E. Smith, Sipp Avenue, Jersey City, N. J. Philadelphia Section; Chairman, Stanley Grady; Secretary, H. E. Stiteler, Broad and Arch streets. Cleveland Section, Chairman, F. R. Hutchinson; Secretary, Wm. Holtz, East Ohio Gas Co. New England Section, Chairman, T. W. Jennings, Boston; Sec., F. K. Wells, 69 Broad street, Boston. Winona Section, Winona, Minn., W. F. Clausen, Chairman. Bethlehem Section, Trueman Weithnecht, Chairman; Sec.-Treas., Truman Buss. South Bethlehem, Pa.

Guild of Gas Managers of New England.—Annual meeting, March, 1914. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, March 18th and 19th, 1914. Chicago, Ills. Officers: President, W. F. Barrett, Chicago, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting, Cleveland, O., September, 1914. Meetings of Sections, monthly. Pres., Charles O. Bond; General Secretary, J. D. Israel, 29 W. 39th street, New York City. Sections: New York, Secretary, C. L. Law, 124 West 43d street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, J. B. Jackson, 28 North Market street. Pittsburgh, Secretary, J. C. Mundo, Oliver Building.

Indiana Gas Association.—Annual meeting, March —— —— 1914. Terre Haute. Officers: President, A. S. Cooke, Terre Haute; Vice-President, A. C. Blunn, Evansville; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, Davenport, May 27, 28, 29, 1914; Officers: President, B. C. Adams, Lincoln, Neb.; Secretary, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October—— 1914. Arkansas City. Officers: President, Al. Newman, Arkansas City; Secretary and Treasurer, Ivan Thomas, Wichita Kas.

Michigan Gas Association—Annual meeting, September, 1914. Place, undetermined. Officers: President, H. W. Douglas, Ann Arbor, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1914; Mexico, Mo. Officers: President, P. A. Bertrand, Joplin, Mo.; Secretary and Treasurer, P. W. Markham, Brookfield, Mo.

National Commercial Gas Association.—Annual meeting and gas show, Dec. 1-6, 1913, Philadelphia, Pa. Officers: President, C. W. Hare, Philadelphia Pa.; Secretary, Louis Stotz, 20 West 39th street, New York City.

Natural Gas Association.—Annual meeting, St. Louis, Mo., May 19 and 20, 1914; Officers: President, E. L. Brundrett, Kansas City, Mo.; Secy-Treas., T. Clive Jones, Delaware, O.

New England Gas Association.—Annual meeting, February, 18th and 19th, 1914, Boston. Officers: President, T. H. Hintze, Providence, R. I.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Annual Meeting, July —, 1913, Asbury Park N. J. President, C. F. Butcher, Freehold, N. J.; Sec'y-Treasurer, O. F. Potter, Newark, N. J.

Ohio Gas Association.—Annual meeting, February ——— 1914 Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, Oklahoma City May, ——1914. President, F. E. Bowman, Ada; Secretary-Treasurer, H. V. Bose Oklahoma City.

Pacific Coast Gas Association.—Annual meeting, Long Beach, Cal., September ——— 1914. Officers: President, C. S Vance. Los Angeles, Cal.; Secretary-Treasurer, Henry Bostwick, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, Allentown, Pa., April ———, 1914; Officers, President, J. A. Frick, Allentown, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 11, 1913; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city.

Southern Gas Association.—Annual meeting, Mobile, Ala., April 4, 1914, Officers: President, James Ferrier, Rome, Ga.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting, May——— 1914, Galveston, Tex. Officers: President, G. H. Gifford, Fort Worth Tex.; Secretary H. S. Cooper, 25 Slaughter Bldg., Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May ———1914, Milwaukee, Wis. Officers: President, Ewald Haase, Milwaukee, Wis.; Secretary-Treasurer, Henry Harman Milwaukee, Wis.